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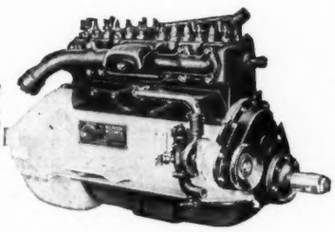

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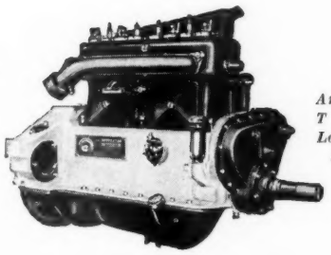

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Editorial Contents, Page 3

Entered as second-class matter Jan. 2, 1913, at the postoffice at New York, New York, under the Act of March 3, 1879.

Advertisers' Index—Next to Last Page

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AUTOMOTIVE INDUSTRIES
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VOL. XXXIX NEW YORK, THURSDAY, SEPTEMBER 19, 1918—CHICAGO NO. 12

Making War Maps by Camera

AERIAL PHOTOGRAPHY NOW AN IMPORTANT AID IN SUCCESSFUL MILITARY OPERATIONS

British Army Issues Official Instruction Book for the Interpretation of Airplane Photographs

AERIAL photography, a new science, and probably the most important in military operations, is just advancing from infancy. A photograph taken from an airplane is an enigma to those not versed in this science. The British Government, following exhaustive studies and experiments, has issued to its army an official instruction book for the interpretation of airplane photographs. The first instruction book, now available for publication because the photographs are no longer true, is presented here almost in its entirety. It shows that so simple a detail as holding the photograph in the wrong position will completely confuse the observer. For example, a sunken road, with the photograph reversed, becomes an embankment because of the direction of the shadows, which are reversed with the photograph.

More intricate details include the understanding of the different shadows, the lighter and darker shades, the detection of camouflage, location of traps, discovery of lines of communication, ammunition dumps, dummy and genuine batteries, movements of troops, etc. The enemy, for example, frequently selects two or three large shell holes in no man's land and establishes an outpost there, developing the shell holes into substantial fortifications and opening a line of communication by a narrow path between the shell holes and the front line trenches. An Allied airplane detects these shell holes by a photograph. The infantry commander is notified. At night a detachment goes over the top and surrounds and surprises the enemy shell hole and outpost, usually returning with prisoners.

The right and wrong way to examine a photograph. The photo shows an embankment of slag. Reversed, it has the appearance of an excavation. This is caused entirely by the shadows. Shadows falling away from one give the appearance of an excavation, and falling toward one the impression of a raised object

Photography from airplanes for reconnaissance purposes was first experimented with by the British service in France late in 1914. Before the war such experiments had not been successful, and aerial photography had been confined to the work of balloons and kites.

The airplane photography difficulties were chiefly from engine vibration. Shortly after the war, with the establishment of trench warfare, balloon and kite photography was found impracticable, and new experiments in airplane photography resulted successfully. The next difficulty was interpretation of the photograph. Oat, wheat and corn fields, barracks, solid

Conventional Signs for Use on Aeroplane Photographs

Meaning.	Sign.	Instructions.
Machine Gun	M G	
Trench Mortar	○	
Dugout	▭	
Concrete Structure	C.	
Fortified Shell Hole	F.	
Observation Post.	O P.	
Wire Entanglements	× ×	Crosses widely spaced shown in front of line of wire
Gap or path in wire		A thin line drawn parallel to actual track
Dump	△	
Battery		Drawn in front of and parallel to position
Battery A A		
Listening Post	L P	
Buried Cable		Drawn at intervals alongside the line, just clear of it.
Overhead Cable		
Railway or Trench Tramway		
Probable Tank Traps	◇	
New Work	NEW	

NOTE.—The sign to be written clear of the object on the photo with a detached arrow pointing to it (when necessary.)

Conventional signs for use on airplane photographs. By the use of simple signs a photograph can be more quickly and easily marked to show the meaning without confusion

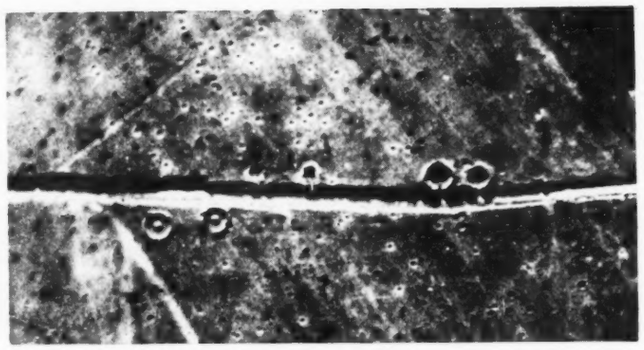
formations of troops, and similar objects, as reflected in airplane photographs, bear no resemblance to their ground appearance, and many experiments were necessary to establish the identity of the different objects reproduced in the photographs.

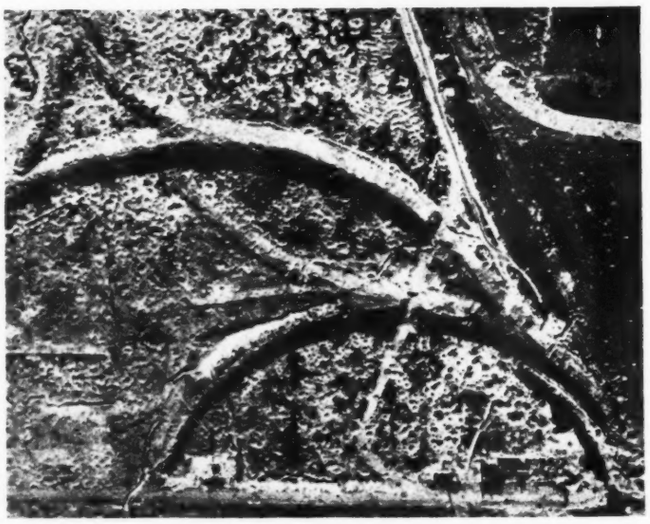
The accuracy of the photograph is indisputable. One plate can cover a square mile of territory, and the entire maze of detail can be taken in one one-thousandth of a second. It is even possible to take a photograph of a large number of railway trucks on trains at a railway junction from a height of 17,000 feet and secure the exact number of individual trucks from the picture.

Another advantage of the photograph lies in the fact that it reflects the scenes dispassionately, while the impressions of the human observer, who might be excited by working under trying conditions, might be exaggerated. Photographs taken periodically of the sector consist at the same time of a biography and a map. Small changes in the trench construction or in the topographical illustrations which the eye could not detect are immediately apparent.

The air photograph is the Sherlock Holmes for camouflage. It often registers the whole history of the construction of an emplacement, showing it prior to, during and following the construction of the camouflage, and marking it as a "tender spot" for artillery fire, following completion.

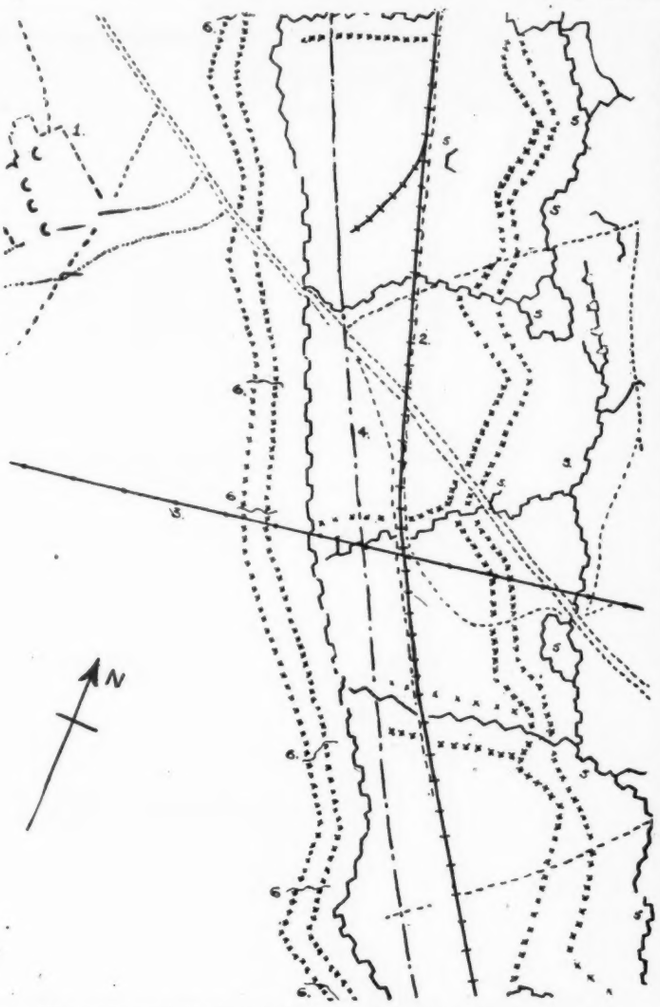
Two kinds of air photographs are taken, the vertical and the oblique, the former being the most useful for intelligence work and mapping. The oblique photographs are used for the detection of camouflage and to give a correct idea of the land, contours, etc. They are also





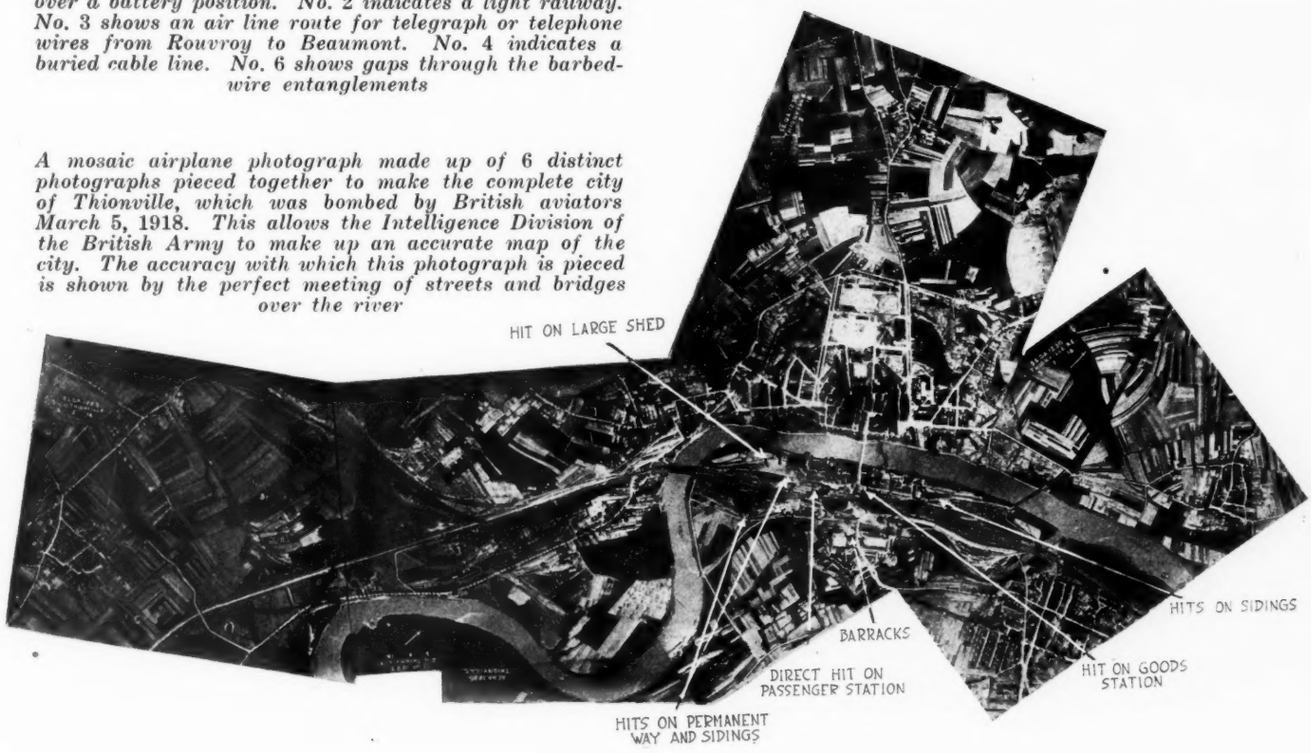
Topographical studies. In all three of these photographs the direction of light is from above. The top picture shows a road banked on one side. A stone quarry is shown in the center view. Railway embankments show the existence of railroads, as clearly discernible in the bottom picture

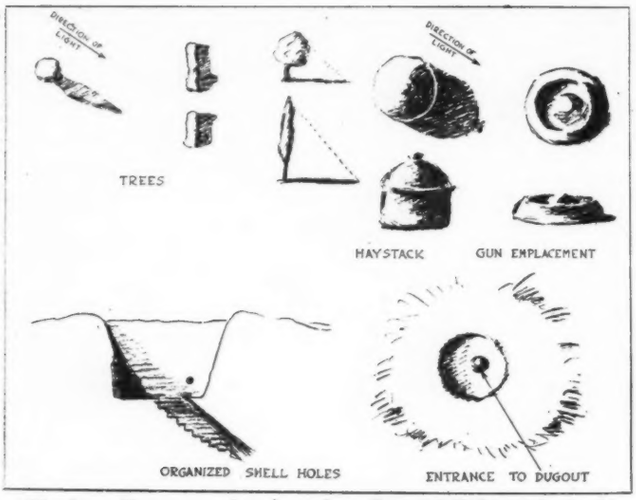
more simple in interpretation, and are used by the experienced infantry and artillery commanders. Mosaic photographs are made by joining a number of vertical photographs at a given locality to make a complete photograph of a city or district. They are usually all taken at the same height and at the same time by a number of planes. In the same way, continuous-line photographs are made by joining strips of overlapped photographs of



The map and photograph above show trenches under construction on the Droucourt-Queant line occupied by the Germans. Point No. 1 shows possible camouflage netting over a battery position. No. 2 indicates a light railway. No. 3 shows an air line route for telegraph or telephone wires from Rouvroy to Beaumont. No. 4 indicates a buried cable line. No. 6 shows gaps through the barbed-wire entanglements

A mosaic airplane photograph made up of 6 distinct photographs pieced together to make the complete city of Thionville, which was bombed by British aviators March 5, 1918. This allows the Intelligence Division of the British Army to make up an accurate map of the city. The accuracy with which this photograph is pieced is shown by the perfect meeting of streets and bridges over the river

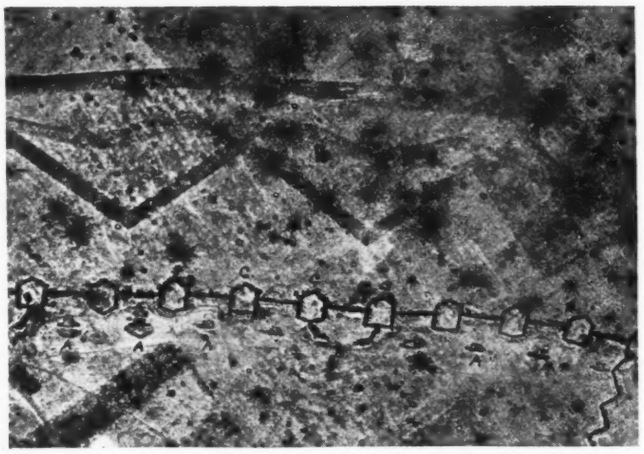




Shadow diagrams showing the effect of light and shade on trees, haystack, gun emplacement and organized shell hole as viewed from above

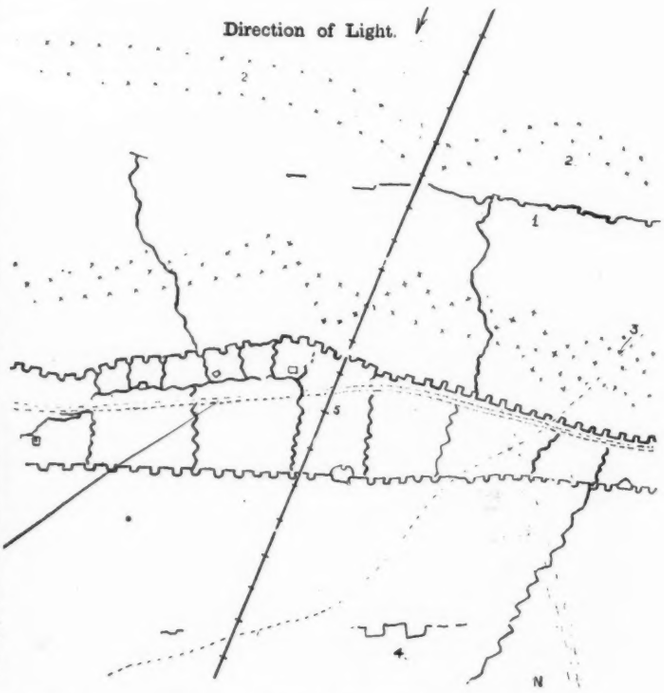
important roads, railways, canals, etc. To secure these, an overlap of about three-sixteenths is worked out in the time intervals between the exposures based on the height and speed of the airplane. Stereograms are much used for detection of camouflage and contours. These are made by taking 2 photographs of the same point at varying intervals, according to the height and speed, and using them in a stereopticon apparatus. For instance, a machine traveling at 60 m.p.h., ground speed, at a height of 1200 ft. would take its second photograph about 2 seconds after the first.

Accurate trench maps are made from the aerial photographs and supplied to the infantry and artillery. In the British Eastern theater of war, where the army was in complete ignorance of the country, maps of the entire district have been made from aerial photographs.

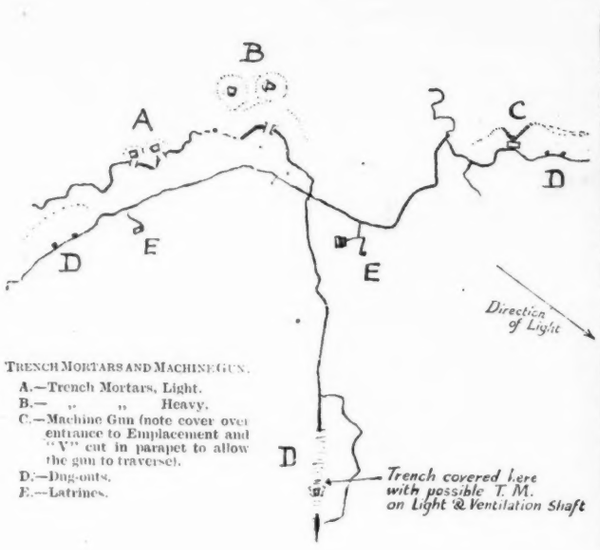


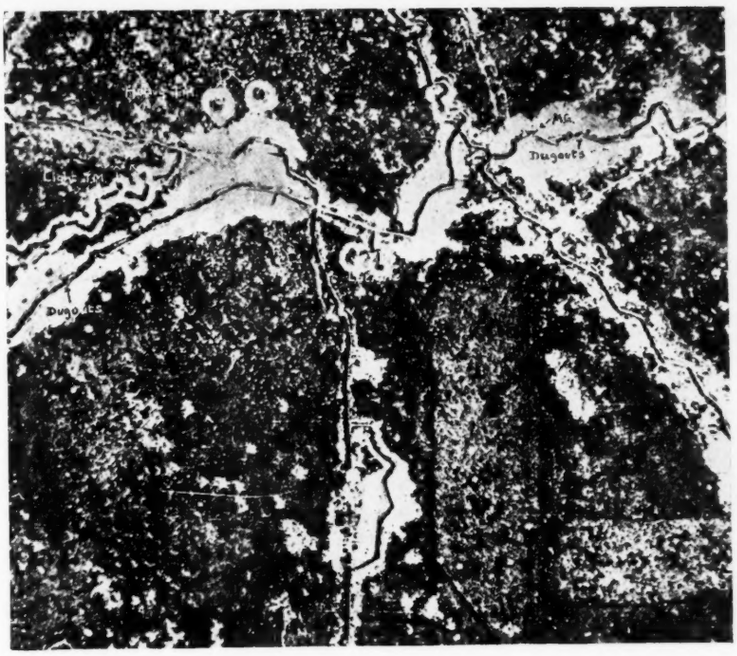
Machine gun emplacements. This photograph shows a new type of machine gun behind the front trench line on the Oppy-Neuport line. The emplacements A are connected underground to the island traverses C. In the case of B, the machine gun nest communicates with the trench on the other side by an open sap. The machine guns fire from open emplacements over the heads of the infantry in these trenches

The intelligence department of the army relies importantly on its aerial photographic section for its information. Through these pictures it detects the gaps and passages through barbed-wire nets, the amount of damage done to enemy wire entanglements, machine-gun emplacements and dugouts by artillery fire, and by means of wireless from airplanes directs the artillery fire until it attains perfect marksmanship.

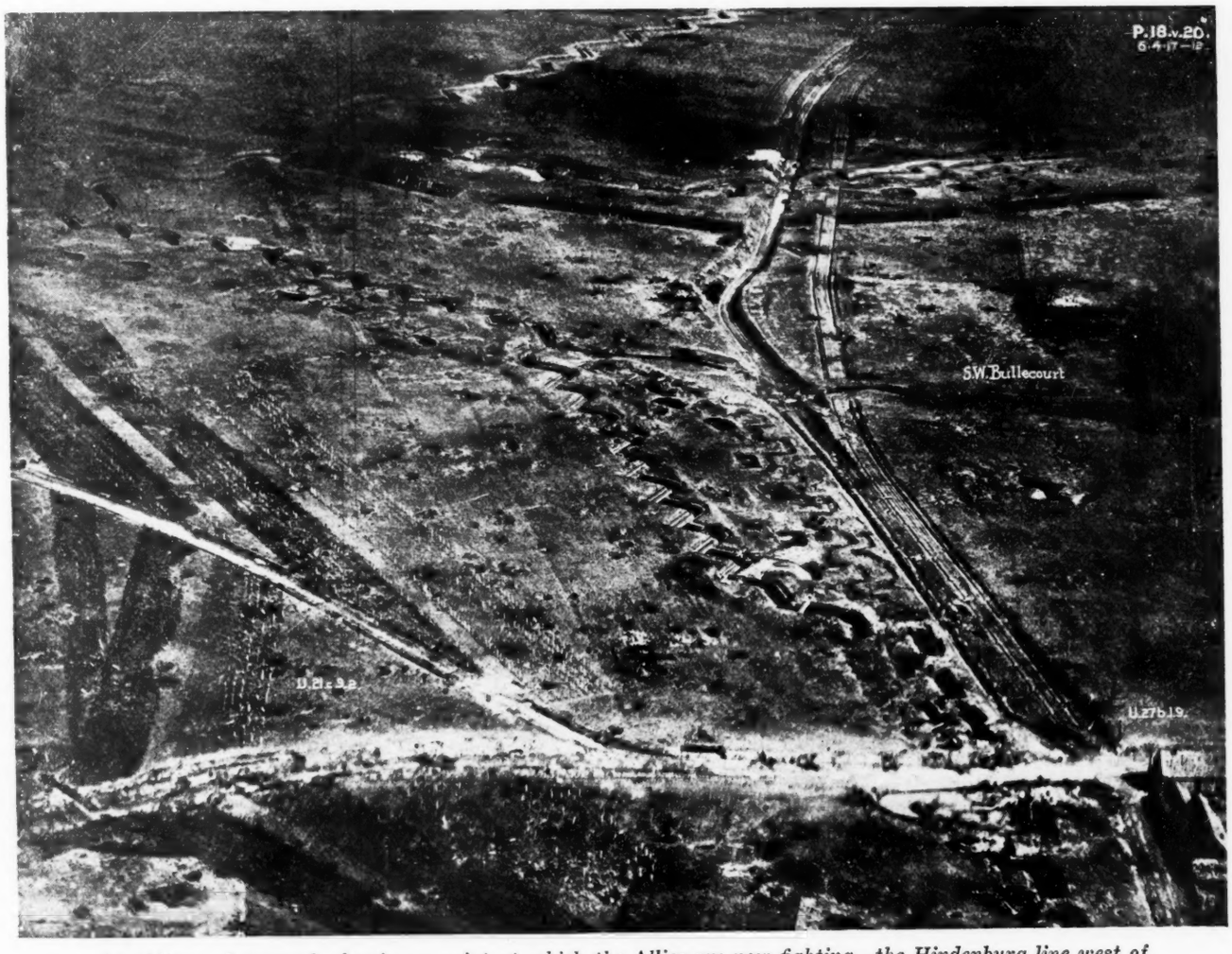


Trench construction and barbed-wire entanglements. This photograph was taken after the battle of Vimy Ridge, when the enemy was forced to the Oppy-Mericourt line. Barbed-wire entanglements which are shown in the photograph in the first line of trenches are penetrated by saps pushed through the wire for the commencement of the new line, No. 1, where another light protection of wire, No. 2, was erected prior to the digging of the trench. No. 3 shows gaps in the old wire across roads. These gaps have been repaired. No. 4 is another trench commenced in the rear of the position and which when completed will give the enemy four lines of trenches. No. 5 shows a tramway





Photograph and outline map drawn from it showing trench mortar and machine gun emplacements



An oblique photograph showing a point at which the Allies are now fighting—the Hindenburg line west of Bullecourt. In front of the front line trenches are barbed-wire entanglements which measure more than one-half mile in width. This particular point is exceptionally well protected, as it is an ammunition station and an important railway center. A sunken road paralleling the railroad is plainly discernible

The Demand for and Supply of Women Workers*

Only 8 Per Cent of American Women Now Employed as Against 26 Per Cent in England—So Far Metal Trades Here Have Drawn Chiefly from Poorer Paid Occupations

DURING the first year after the United States entered the war the general introduction of women into occupations previously filled by men was discouraged in many quarters. At the beginning of 1918 the United States Secretary of Labor was quoted as expressing the opinion that there was an ample supply of labor both for the army and for industry; that the problem was one of proper adjustment, and that it was the policy of the Labor Administration to prevent the introduction of women into new occupations as long as men were available.

This attitude was reflected in the position taken by many State councils of defense and other official bodies. Private associations interested in safeguarding labor standards were also extremely conservative toward the wider employment of women. At the end of 1917 reports issued by the New York State Industrial Commissioner and by the American Federation of Labor maintained that employment difficulties arose not from a real labor shortage but from defective distribution, due to increased activity in some industries receiving war contracts, and to greatly reduced business in industries not essential for the prosecution of the war. Many manufacturers were of the same opinion.

Will Require Four Million Workers

To-day, however, the needs of industry are becoming more urgent. The United States Employment Service recently estimated that from 3,000,000 to 4,000,000 workers will be required in essential occupations, including agriculture, during the next twelve months. It is reasonably certain, therefore, that there must be a far-reaching occupational readjustment, which will compel the admission of more and more women workers to industry.

In the United States, the proportion of the female population now employed is approximately 8 per cent, as against 26 per cent in England. To make the number of women employed in the two countries proportionate would mean the addition of 8,152,135 women to the ranks of industry in the United States. While such a radical readjustment as was effected in England may never be necessary, preparations for the gradual introduction of women into industry can be most satisfactorily made now, while the proportion of skilled men is still so high that changes should not seriously interfere with production of materials required for war purposes.

In the discussion of women's employment in occupations new to them it has often been assumed that they came from a class not previously employed. That this would be highly improbable, at least, might be inferred from the experience of other belligerent countries. After the early months of unemployment in Great Britain immediately following the outbreak of the war, one of the most marked features of the labor market was the shifting of workers from slack industries to those experiencing unusual activity. For example, it is estimated that in Great Britain 400,000 women were drawn from the domestic servant class and from small dressmaking establishments into the war industries, which offered higher wages. Of 1,407 female workers in a French munition factory, in 1915, all but 480 had been previously employed in some wage-earning occupation.

In Canada, where the labor situation is much more comparable to that in the United States, such a shifting from the so-called "women's industries" was also characteristic. The Deputy Minister of Labor for Canada reported that "the movement of woman labor was chiefly from the poorer paid to the better paid industries."

Many employers interrogated in this investigation likewise secured their women workers from other factories, though not necessarily from the same occupations. One manufacturer of elevating and conveying machinery, employing nearly a hundred women, stated that 50 per cent of them were previously doing machine work. An automobile manufacturer who utilizes women chiefly on sewing machines in the trim department, obtained them largely from those doing similar work in other factories. The majority of the winders in a plant manufacturing ignition apparatus had been similarly employed elsewhere. In one establishment, women who are molding and making, carrying and packing cores are largely Belgians who were accustomed to doing heavy manual work in their own country.

Transferred Between Departments

Some employers did not even go outside their own plants to secure women for new work, but simply transferred them from one department to another. In some establishments, women previously employed as inspectors or assemblers were transferred to machine work. An employer who intends to introduce women on a large scale within a few months reported that he should give the preference to friends and relatives of his employees. This plan has already been successfully tried in several establishments.

In other cases, such transfers were carried out among the male employees so as to avoid introducing women on shop work. For instance, one employer reported it to be his policy to transfer men from clerical to mechanical positions when that could be done, filling the office vacancies thus created with women. He stated that training had developed many inferior clerks into good mechanics.

Frequently, women who have entered the metal trades in the present war-labor emergency came from a great range of occupations not immediately related to their

*From the Report on Wartime Employment of Women in Metal Trades of the National Industrial Conference.

new employment. An automobile manufacturer employing 423 women in 23 different departments reported that they had seldom been previously engaged on machine work. In another automobile plant where nearly 300 women are engaged in various types of machine and shop work, the force was recruited approximately as follows:

Twenty-five per cent assemblers from other plants; 20 per cent machine hands from other plants; 20 per cent clerical workers from other plants; 20 per cent from housework; 5 per cent from laundries; 5 per cent from restaurants; 5 per cent had not worked before.

Sometimes the influence of local industries is evident in the source of labor supply. For instance, a machine tool establishment obtained employees from operatives in cotton and woolen mills; a firm manufacturing valves secured its female workers from near-by knitting mills; and a manufacturer producing small munition parts drew on department stores, cloak and suit manufacturers, electric lamp factories, and domestic service.

Reports from the Associated Charities in several cities indicate a decided increase in the employment of negro women in many kinds of manufacturing establishments; as yet, this class of female labor has not been extensively utilized in the metal trades and similar industries. In a recently published article the representative of a company manufacturing steamfitters' supplies recommended negro women for the operation of light semi-automatic machines, punch presses and drill presses, at the same time suggesting that least friction will result if they are employed in departments separate from the white workers.

Higher wages were an important factor influencing the shifting of female labor. Thus women formerly in domestic service constitute a considerable proportion of new workers in the metal trades; the shorter hours and other working conditions may have been an added consideration. To some extent this also explains the movement of women from other industries into the metal trades. At the end of 1917 a leading textile journal contained a warning to manufacturers in the cotton and woolen industries that they must improve the surroundings and working conditions in their factories in order to meet the competition of war industries for woman labor, and reduce their turnover.

In 85 establishments reporting for the present investigation, 17.3 per cent of a total of 22,750 women employees were married. Many men who have entered the national service were the only wage earners in their families, and very frequently wives who were employed before their marriage have found themselves obliged to return to work. Employment of an increasing proportion of married women in industry has, however, been one of the striking social changes of the past thirty years.

In England the first instalments of war workers, especially those trained in technical schools, were secured through regular employment channels, through advertising, and through canvassing friends and relatives of those already employed, but the British Government has since drawn on a more educated type. Whether it will be necessary to recruit workers from this source in the United States will obviously depend on the duration and future demands of the war.

Unmined Petroleum Supply Limited

Seventy Barrels Per Person in United States—Vast Areas of Oil Shales in Reserve—Greater Extraction of Values Necessary—Much Production Wasted

By Allen Sinsheimer

WASHINGTON, Sept. 17—The unmined supply of petroleum, now available, in the United States is 70 barrels per capita. The presence of extensive deposits of oil shale in this country, however, removes the danger of early physical exhaustion of oil but cannot be considered license for continuation of the present wasteful customs of production and use. There are 7,000,000,000 barrels of petroleum still under ground in the United States, as compared with approximately 3,500,000,000 barrels which have been produced. One-half of the petroleum produced yearly is wrongly used for steam raising. The petroleum consumed in and exported from this country this year exceeds the production in the United States and that imported from Mexico. The cracking process, because of the great demand for gasoline and decreasing supply of petroleum, may be regarded as the hope for the future. Up to this time gasoline has been the main prop to the cost structure of petroleum refining, but the entrance of the United States into the war, with the consequent increased demand for fuel oil, has changed the complexion of the oil situation. And as crude petroleum production has been unable to keep pace with the consumption of fuel oil, serious shortage results even while gasoline is ample for all needs. The automobile has been the prime factor in developing gasoline production.

These statements, taken from a bulletin issued by the United States National Museum following a comprehensive survey of the petroleum situation by Chester G. Gilbert and Joseph E. Pogue of the Division of Mineral Technology, form the most important details of the report.

The bulletin, which is exceedingly timely, has been prepared to interpret the significant aspects of the petroleum situation, in non-technical language. Following a discussion of the nature, occurrence, origin, distribution, production, transportation and refining, the report takes up the important question of limitation.

The Extent of the Supply

The proven and prospective oil fields of this country, it says, are broadly known and the petroleum reserves may be estimated within a reasonable margin of error. The accompanying chart, reproduced herewith, shows a production of 350,000,000 barrels in 1917 and a probable production of 575,000,000 barrels in 1930. This chart, it is said, shows that a big fraction of domestic petroleum is gone; whether that fraction is one-third as present knowledge indicates makes no difference in

the consideration demanded by the situation and we face an economic fact that must be reckoned with now.

"It is, of course, very evident," adds the statement, "that the present tendency cannot persist to the point of even approximate exhaustion, because conditions such as price increase, growing imports and others, naturally arising, will serve to relieve the tension and thus spread the remaining supply over a greater number of years. So in spite of its sensational character, the physical exhaustion of the petroleum resource is a theoretical matter of purely academic interest. But of practical importance is the period of economic stress that is ushered in when the resource faces a greater demand than it can fill in the customary manner. That is a period of readjustment to meet the new conditions and arrives far in advance of physical exhaustion."

Constant Local Adjustment

Local adjustments are constantly under way even now, says the statement, as petroleum fields reach their production climax and decline, and these fields forecast the history of the resource in its entirety. This can be plainly seen in Fig. 2, shown herewith. Since petroleum resources are not only limited in size but also in ability to sustain the present rate of increase in production, the bulletin continues, and since trucks, tractors, airplanes and passenger cars forecast a still greater demand for gasoline it is probable that this will be one of the important continued products of petroleum and that it must develop intensive production.

The use of fuel oil for steam raising is regarded as a waste, unavoidable at present because of existing facilities necessary and demanding it, but is a practice which must be discontinued in the near future. Over half of the petroleum currently produced is used as fuel for steam raising. Kerosene consumption, although increasing, must be discontinued to meet the lighting demands of rural districts. Lubricating oils can be manufactured from oils distilled from shale and from coal as is now done in those countries lean in petroleum, such as Scotland and Germany. At the present time in this country petroleum is produced and manufactured into products far in advance of lubricating needs, which means that the lubricating portion of the resource is being exhausted at a rate dictated by the demand for oil for power generation. Thus the exhaustion of our principal lubricant resource is being accomplished with much greater dispatch than is justified by true necessity since part of the fuel demand could be filled by means such as coal and hydroelectricity not involving a sacrifice of potential lubricants.

Conserving the Supply

The outbreak of the European war in 1914 found the United States petroleum industry suffering from low prices caused by gross overproduction resulting from large yields in Oklahoma. These yields declined in 1915 and this, combined with the general increase in automobile consumption of petroleum products, increased the price. The entrance of the United States into the war with the consequent growing importance of petroleum products as war needs further increased the prices and demand, and the United States is now consuming and exporting more petroleum than she is producing from her own wells and receiving from Mexico. The discrepancy which is growing monthly is covered by a draft upon the petroleum storage in this country, which amounted to 153,000,000 barrels Jan. 1, 1918. This storage cannot be safely reduced below 50,000,000 barrels, which are needed to fill the pipe lines and keep the whole industry in operation. Fig. 3 shows the current petroleum situation. Transportation from Mexico to this country is in such condition that there is scant hope of increasing the supply from that source unless concrete tankers can be quickly constructed.

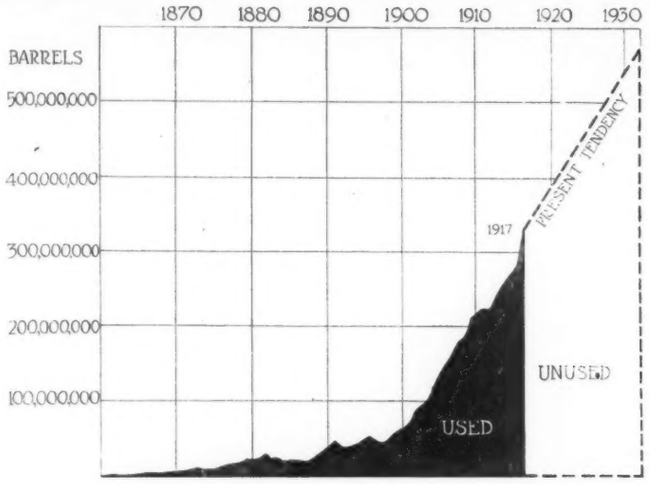


Fig. 1—Chart showing the present tendency of the United States in respect to its unmined reserve of petroleum

Discussing the problem itself, the bulletin points out that the enlargement of the resource capacity can be brought about in three ways:

1. By prolonging the life of the unused portion of the domestic resource as it is now known.
2. By developing low grade domestic sources not yet drawn upon.
3. By building up the use of substitutes particularly for gasoline for which there is a heavy growing demand.

Production Waste Must Be Eliminated

Prolonging the life of the petroleum reserves can be accomplished by discovery of new oil fields, elimination of wastes in production, greater extraction of values and development of foreign supply sources. There is not much hope for new fields in this country. The petroleum resources are now fairly accurately measured and there is no basis for believing that great areas of oil reserves lie undiscovered. Much can be accomplished by the elimination of production wastes. Present practices allow from 30 per cent to 90 per cent of the oil to remain under ground. An appreciable percentage of that produced is lost by fire and much is dissipated by seeping and evaporation due to inadequate storage facilities. On the average, therefore, it is said, less than 25 per cent of petroleum under ground reaches the pipe line. Subtracting the losses involved in improper and wasteful utilization the recovery factor becomes as low as 10 per cent. Waste connected with oil well drilling is caused by the harmful infiltration of water from water bearing strata and the uncontrolled escape of natural gas encountered in the course of drilling. Frequently there are wastes caused by unexpected gushers when the oil runs rampant over the ground. This often results in fires.

Greater extraction of values, it is recommended, can be accomplished by the extension and further improvement of the cracking methods of distillation which were discussed at length in last week's issue of AUTOMOTIVE INDUSTRIES, through the improvements in the design and efficiency of the internal-combustion engine, through the widening use of the Diesel type of engine,

through gradual deflecting fuel oil from its rôle of a steam-raising understudy to coal, and through a carefully planned program for building up a great oil by-products industry to give multiplications of value to the portion of oil left after energy, light and lubricating values are extracted. The by-product substances manufactured from crude petroleum afford great possibilities for future industrial usage for edibles, synthetic rubber, dyestuffs, etc. The Diesel type of engine, it is said, is the most economical heat engine, from a thermal standpoint, that has been devised and most nearly approaches theoretical maximum efficiency.

Mexican Fields and Our Shale Deposits

Since 1911 this country has been drawing upon the Mexican oil fields at an increasing rate, Mexico supplying 10 per cent of our needs in 1917. The Mexican pools are the richest in the world and are capable of much greater annual production than has yet been taken from them. The Central American region has promising oil districts but none have developed in any way comparable to the Mexican deposits. The Mexican deposits, recommends the bulletin, should not be so wastefully exploited as have been those of the United States.

Within the last 5 years geological explorations have established the existence of vast areas of black shale in Utah, Colorado and Wyoming which are capable of yielding, upon distillation, around 50 gallons of oil, 3000 cu. ft. of gas and 17 lb. of ammonium sulphate. Oil shale is not supposed to contain petroleum, but applications of heat have caused reactions forming oil resembling petroleum from which, it is thought, products similar to those yielded by petroleum can be obtained. There have also been other oil shale districts found in Nevada, California, Montana, Arizona, Oregon and several other states which, although not so large, give promise of an immense area in the aggregate and represent a potential oil source sufficient to supply this country for hundreds of years.

Because petroleum is not fixed in position and much of the production is won through the efforts of small operators to reach oil quickly there is a ruthless sacrifice and this is one fundamental cause of waste. The gambling character of wildcat drilling leading to a desire for quick returns with little regard for engineering efficiency is another. These must be prohibited. A general constructive economic policy leading to sound development of petroleum industries, discouraging unrestricted competition in production is necessary. Encouragement of the by-product, oil shale development, benzol and alcohol production and the use of more efficient internal combustion engines form the important solutions. The exploration for petroleum as now guided by the principal of gambling, the competitive extraction of petroleum within single reservoirs, the utilization of petroleum in part by the principle of perversion as its usage for steam raising, must all be banned, summarizes the bulletin, if we are to place petroleum resources on a sound basis.

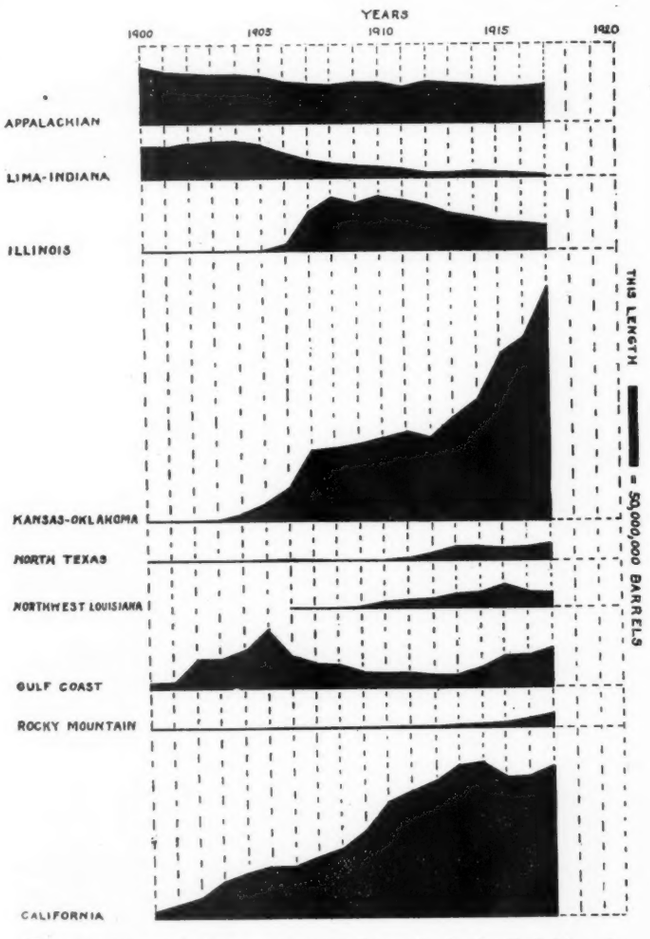


Fig. 2—The relative output of the principal oil fields of the United States from 1900 through 1917. Note the dominant positions held by the Kansas-Oklahoma and California fields. Data from U. S. Geological Survey

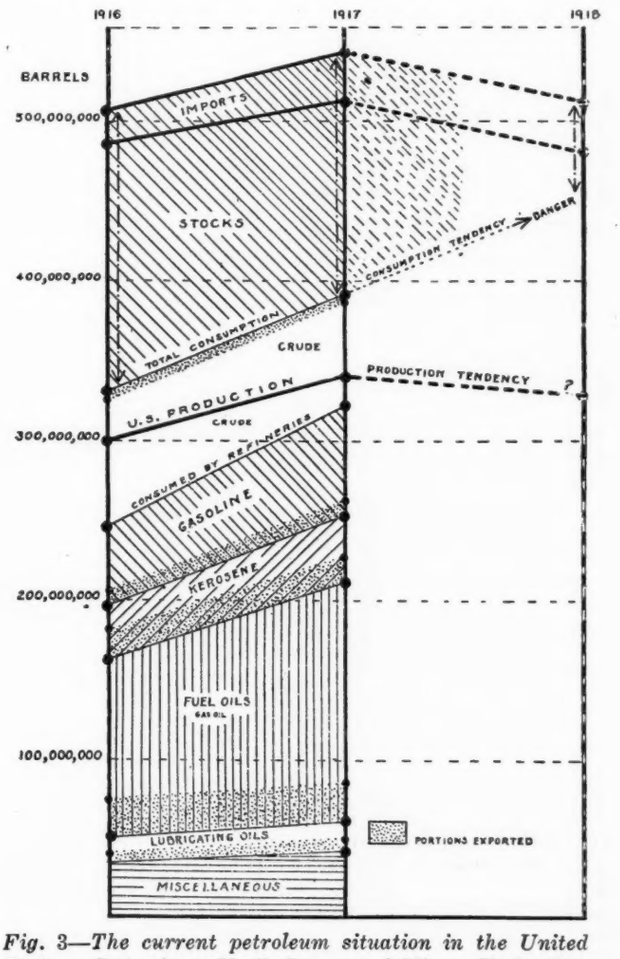
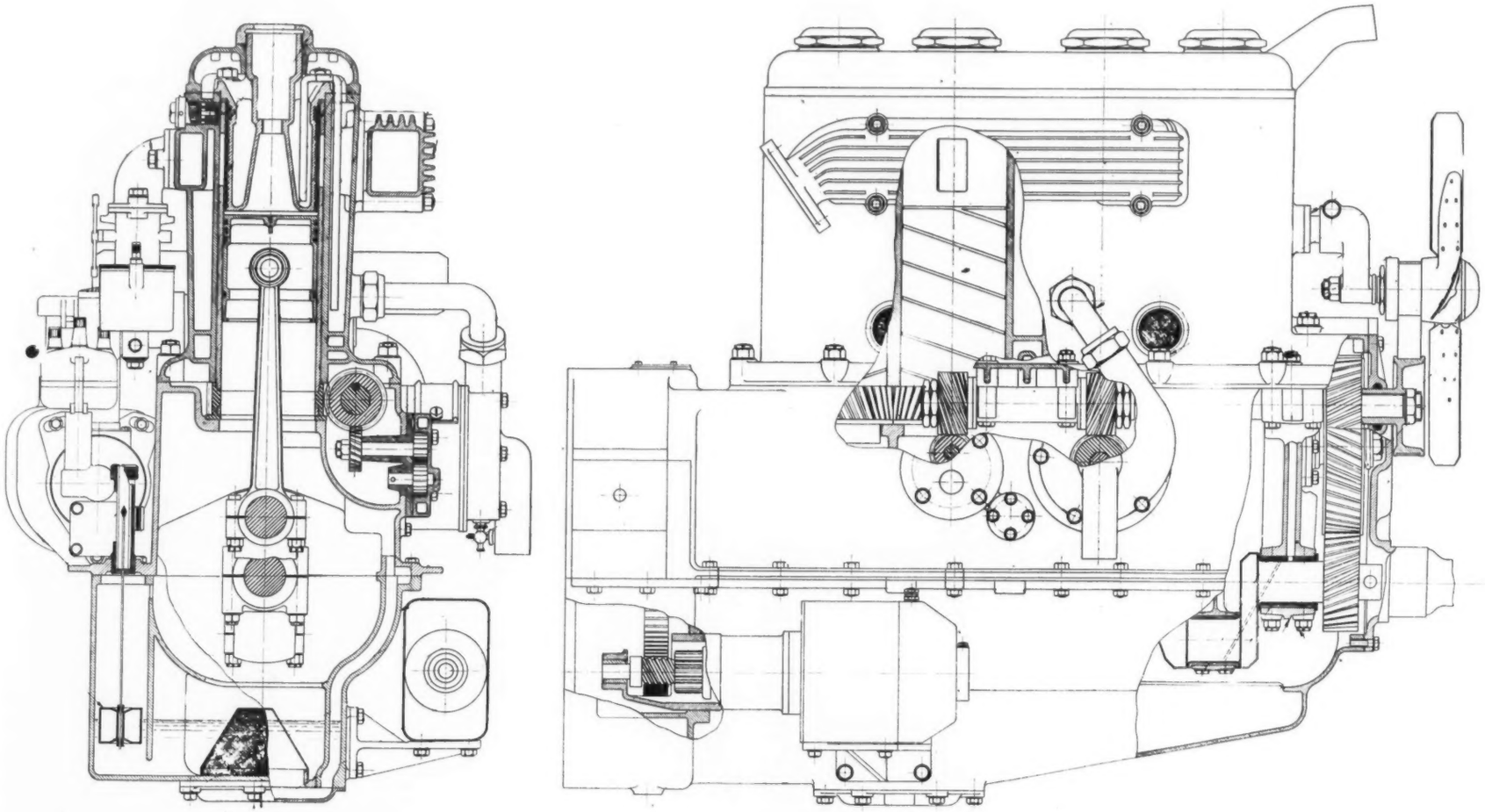


Fig. 3—The current petroleum situation in the United States. Data from U. S. Bureau of Mines, U. S. Geological Survey, Bureau of Foreign and Domestic Commerce and other sources

Longitudinal and Cross Section of American Sleeve Valve Engine



This is the latest improved design of this engine, which differs in various details from the engine exhibited at the New York show last winter

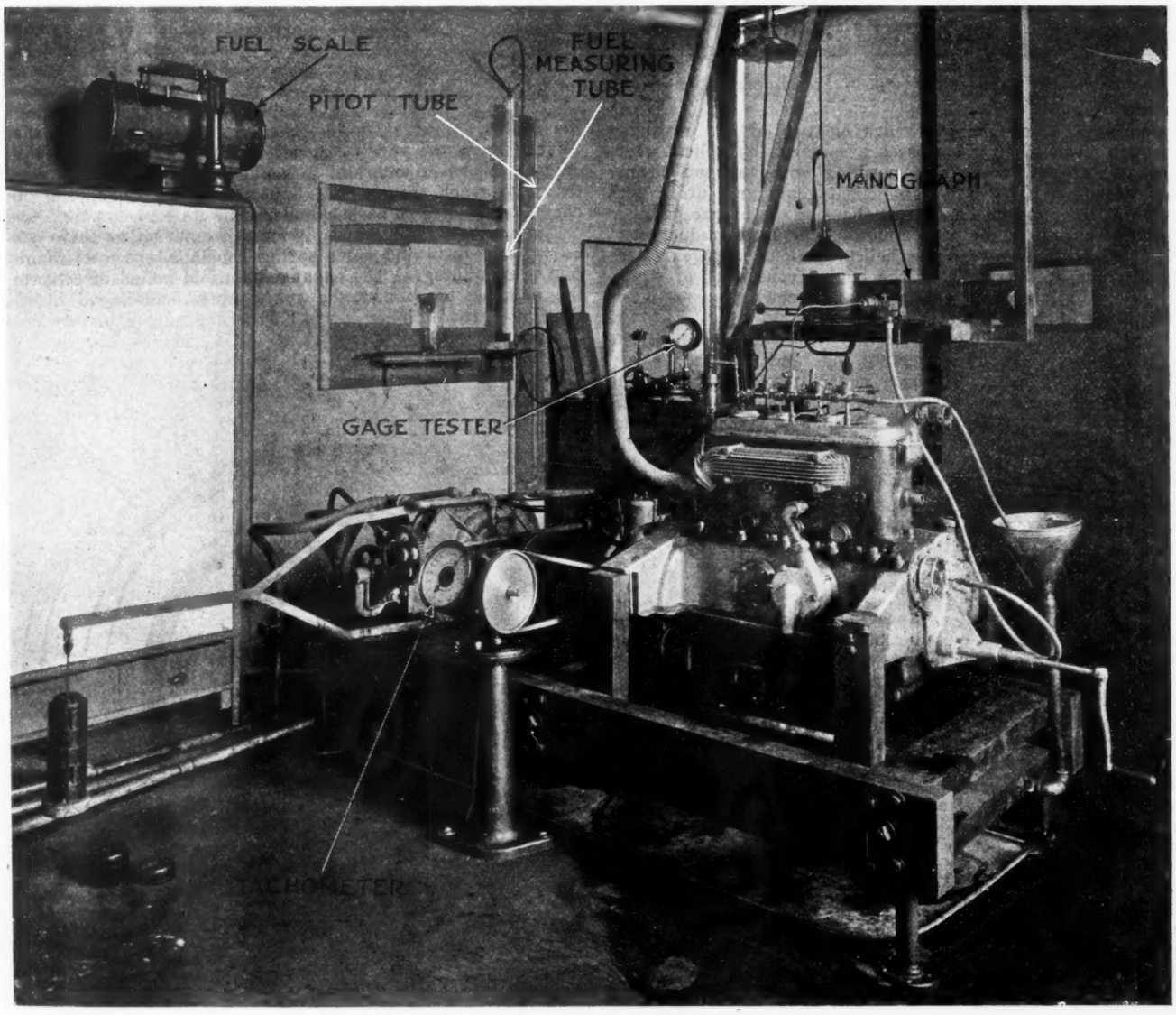
Tests of a Sleeve Valve Engine

Engine of the American Sleeve Valve Motor Corp. Has a Single Sleeve Rotating at Uniform Speed—Manograph Diagram and Horsepower and Torque Curves Show Its Characteristics

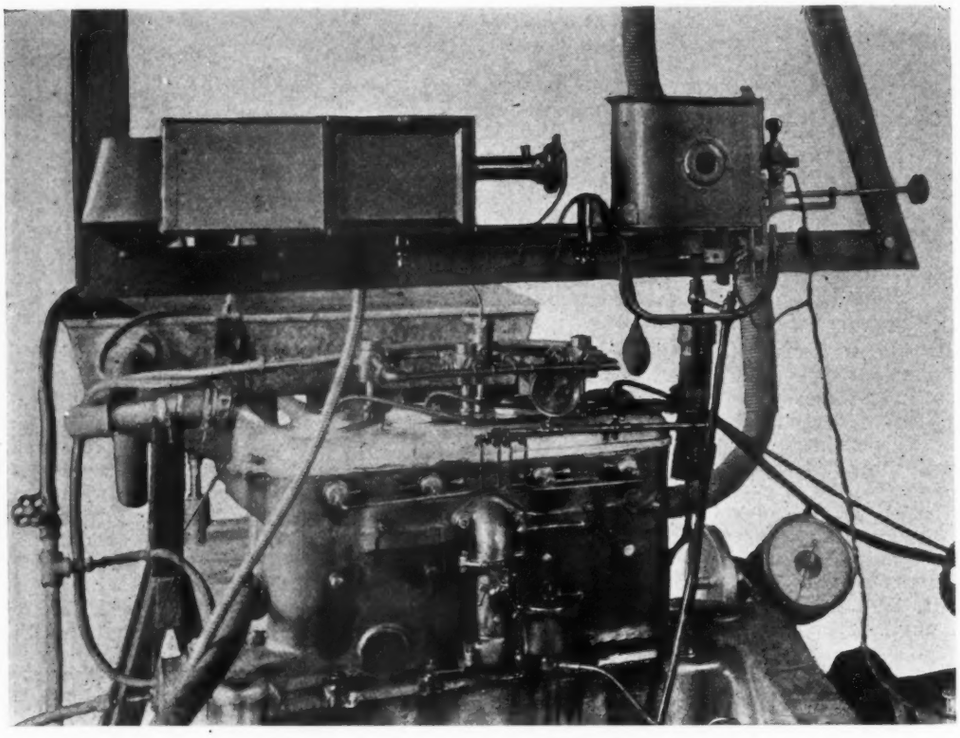
A REPRESENTATIVE of AUTOMOTIVE INDUSTRIES recently had occasion to visit the laboratory of the American Sleeve Valve Motor Co., 1926 Broadway, New York, where development work is at present being done on the American sleeve valve engine. This engine was exhibited at the New York show last winter, and a brief description of it appeared in these columns at the time.

It will be remembered that there is a single sleeve in each cylinder between the cylinder wall and the piston which rotates at uniform speed making one revolution to four of the engine crankshaft. This sleeve has two equal-sized ports cut into it, one directly opposite the other, which ports are adapted to register with ports in the cylinder wall and in the extension of the cylinder head down into the cylinder, thereby performing the inlet and exhaust functions.

The cylinders are of 4 in. bore and 5 in. stroke, giving a piston displacement for the four cylinders of 251.2 cu. in. These dimensions it will be well to remember in connection with the test results to be given further on. All four cylinders are cast in a block, and there is no water space between each pair of outer cylinders. The revolving sleeves are turned through helical gears at their lower ends, meshing with corresponding helical pinions on a longitudinal shaft, which latter is driven from the crankshaft through a train of helical spur gears without change in rotative speed. There are only two helical pinions on the longitudinal shaft, which



Set-up for dynamometer and manograph tests



Close-up view of the engine, manograph and arc lamp

mesh with bronze helical gears on two of the revolving sleeves. The other two sleeves are driven by helical gears formed integral with them meshing with the two bronze helical gears. The cast iron helical gears are cut in with teeth of the opposite hand from those of the bronze gears in order to permit of the proper mesh. The entire reduction of 4:1 is effected between the helical pinions and gears, the gear train at the front of the engine consisting of equal-sized driving and driven gears and a somewhat larger intermediate gear.

Little need be said of the construction of such parts as crankcase, crankshaft, connecting rods and pistons, as they do not differ materially from conventional designs. The crankcase is divided horizontally through the crankshaft axis and all three crankshaft bearings are carried by the upper half. The crankshaft is partly balanced by extending the crank arms adjacent to the main bearings an equal distance past the main journal in both directions, and undoubtedly a very rigid crank is produced without incurring the disadvantage of excessive weight by making the central arms unusually thick and boring them out.

Separate Head for Each Cylinder

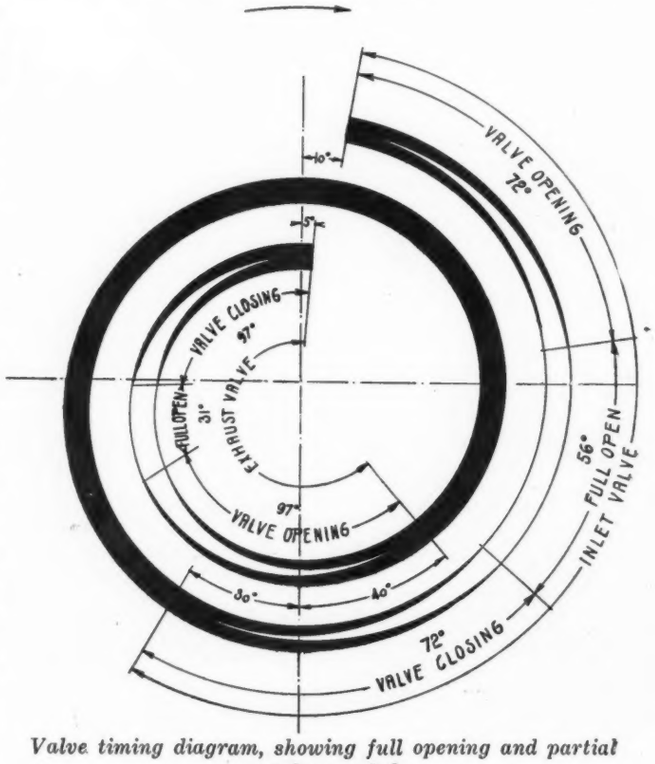
The water jacket extends practically the entire length of the cylinder, and the cylinder block rests on the crankcase by a flange on the water jacket wall rather than the cylinder wall, as the space below the cylinder wall is taken up by the sleeve gear. It is interesting to note that the bronze gears are doweled into the sleeve by means of integral dowels formed with the aid of the oxy-acetylene torch.

A rather interesting form of cylinder head is used, which is separate for each cylinder. It consists of an aluminum casting over which is screwed a steel sleeve. Two longitudinal slots are cut in the latter, quite close together and extending nearly the entire length of the sleeve, one from one end and one from the other. This gives the threaded sleeve a certain flexibility, making it similar to a piston ring. At the upper end of the sleeve the thread is omitted and this end passes over a couple of expansion rings in a single groove in the piston head, which rings exert a pressure against the steel sleeve tending to expand it against the revolving sleeve.

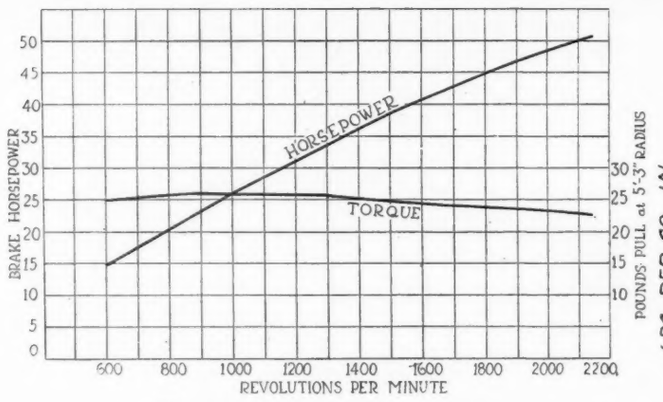
Ports of rectangular shape are accurately cut in the steel sleeve, these being somewhat smaller than the ports cast in the cylinder head and thus determining the exact moments of the beginning and end of the valve functions. The ports in the revolving sleeve are larger or wider than those in the cylinder wall and cylinder head, with the result that these latter are fully uncovered for a certain period of time. Owing to the fact that the valve sleeve rotates at uniform speed, the valve opening increases rapidly and uniformly from nothing to the maximum, then remains for a while at the maximum and then decreases to zero in the same way as it increased to maximum.

Two important problems connected with the design of an engine of this type are the lubrication of the sleeves and the prevention of leakage of gas from the ports around the valves. These two problems are somewhat connected, for with proper lubrication of the sleeves around the ports there is no danger of gas leakage. It will be seen that the revolving sleeve is cut with helical oil grooves over its whole length below the ports, which are designed to distribute the oil. But oil from the spray can get on to the revolving sleeve only at the lower end, and it would have a long distance to travel to reach the extreme upper end, hence a special oil head is connected to each cylinder near its top.

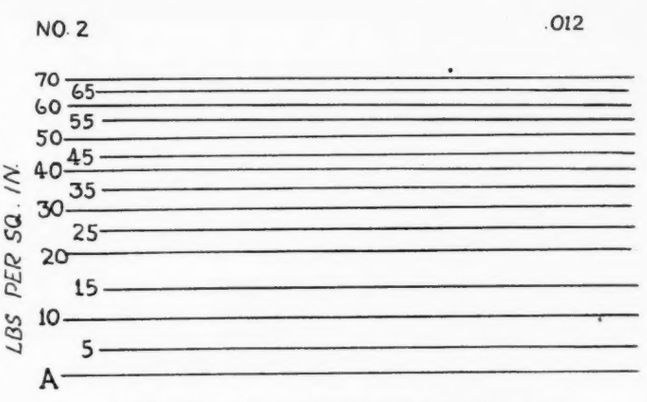
The engine is of remarkably smooth exterior, as there are no valve pockets and valve spring housings, the inlet manifold is cast integral, the exhaust manifold bolted directly to the cylinder block and the spark plugs submerged below the top of the cylinder heads. The plugs are evidently not



Valve timing diagram, showing full opening and partial opening periods



Horsepower and torque curves



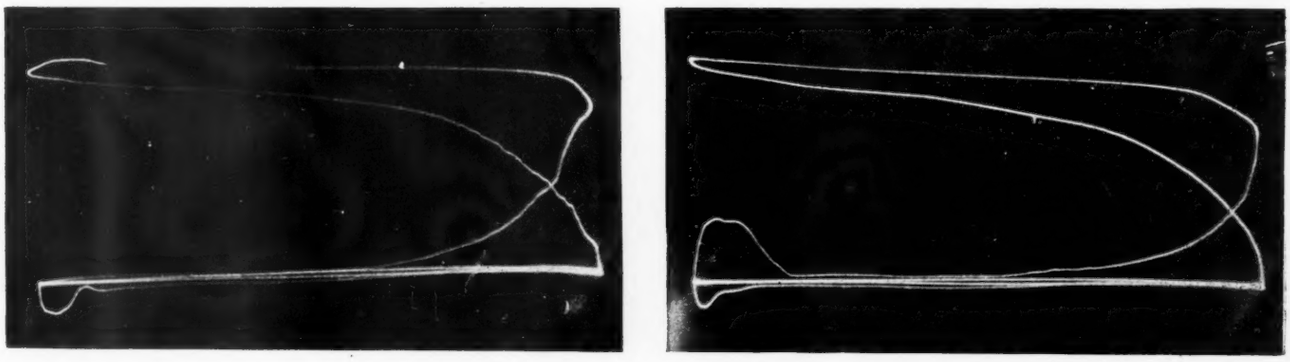
Calibration chart of manograph diaphragm

very accessible, but since they are so located that they are very effectively water cooled, they should very rarely require attention.

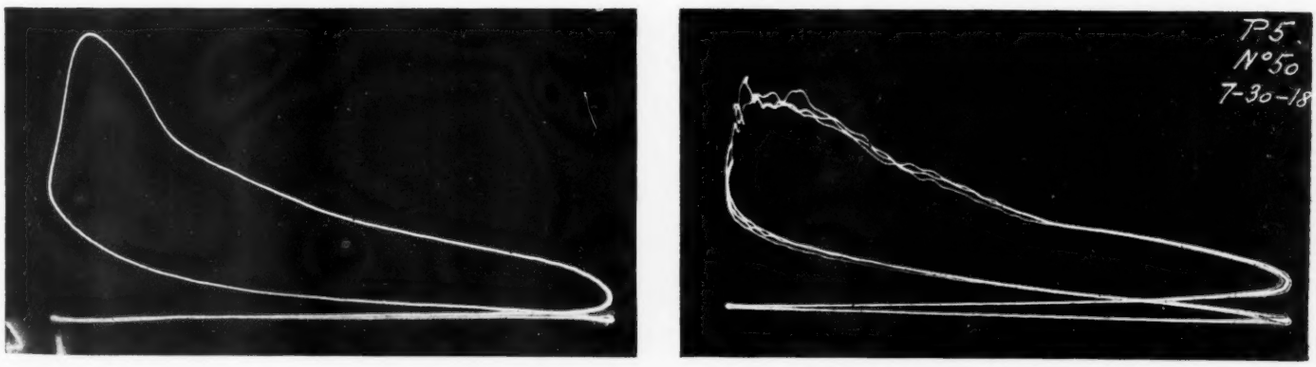
The engine has been subject to development work during the past year, and various changes in timing and other features have been made to increase its output and better its fuel economy. Recently H. C. Gibson, who introduced the Hospitalier manograph in this country, has been acting in a consulting capacity to the American Sleeve Valve Motor Co. and has made a thorough study of the engine by means of the manograph. Some of the diagrams taken by him are reproduced herewith. To insure absolute accuracy in determining the pressures shown on the diagrams, the diaphragms of the manograph were calibrated by means of a Schaeffer & Budenberg gage tester. This consists of a small cylinder partially filled with oil on which rests a piston supporting a given weight. As the bore of the cylinder is accurately known, the pressure per square inch on the oil can be readily calculated and can be made anything desired by merely varying the weight on the piston or plunger. By admitting the oil to the diaphragm chamber of the manograph and observing the motion of the spot of light corresponding to different weights on the plunger of the gage tester, data may be obtained for a calibration chart of different diaphragms. Diaphragms of different gages of metal are used for different tests. For instance, when it is desired to obtain only the compression curve of the engine a diaphragm of lighter gage is used than if the explosion curve is to be traced, and if the exhaust and intake curves are to be obtained only, use is made of a diaphragm of very light material and a "pillow" of metal is placed behind it which limits the amount of its deflection.

Two of the photographs reproduced herewith show the set-up for these tests.

The engine is connected to a Herschell-Spillman hydraulic dynamometer. Fuel is drawn from a tank on a weighing scale supported on a shelf high up on the wall so that gravity feed may be used. The manograph is supported directly above the engine on a frame suspended from the ceiling. It is a single diaphragm instrument, and connection to the different cylinders can be readily made by means of valves. In the view of the complete engine and dynamometer may be clearly seen both the pressure connection and the motion connection to the manograph. Motion is obtained



Without exhaust pipe—Diagrams taken with pillow behind diaphragm—With long exhaust pipe



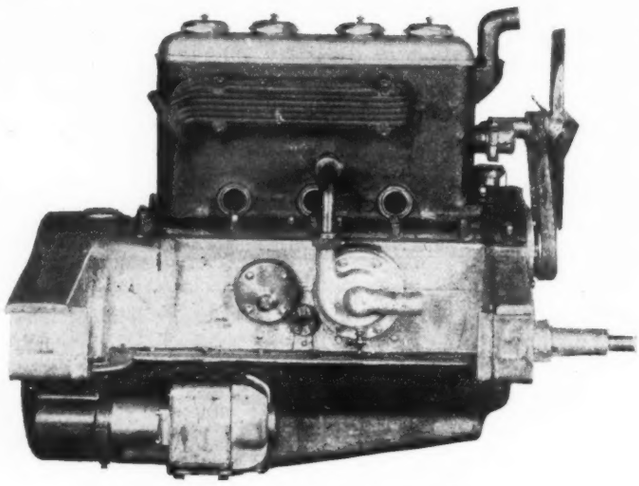
600 r.p.m.—Full throttle diagrams—1800 r.p.m.

from the end of the valve shaft, which runs at the same speed as the crankshaft and is more accessible than the latter.

Adjacent to the manograph will be seen the electric arc lamp which furnishes, through a pinhole, the spot of light that traces the diagram. Ordinarily the spot of light traces the curve on the mat glass surface of the manograph, the entire diagram standing out clearly, owing to the persistency of vision. But a film pack is attached to the instrument, and a photographic record of the diagram can be obtained with very little trouble.

A number of diagrams obtained from the American sleeve valve engines are reproduced herewith. The first two were taken with a diaphragm only 0.0075 in. thick with a pillow block behind it. This will indicate pressures only up to about 12 lb. per sq. in., as at higher pressures the diaphragm rests against the pillow block. Therefore, the variation of pressure during the exhaust and intake strokes only is recorded. The uppermost, horizontal line is traced during the explosion stroke, the diaphragm lying snug against the pillow block. At the end of the power stroke the pressure drops and comes within the range of the diaphragm. During the return or exhaust stroke the spot of light accurately indicates the variation of pressure in the cylinder. It will be observed that the only noticeable difference between the two diagrams taken with the light diaphragm and pillow block is that one shows a notable increase in pressure at the end of the exhaust stroke while the other does not. What caused this difference was that in the first case the engine exhausted through a long exhaust pipe extending clear across the room, while in the other case it exhausted directly into the atmosphere. In the first case, owing to the overlapping of the exhaust strokes of succeeding cylinders, some of the spent gases from a cylinder just beginning to exhaust are blown back into the cylinder completing its exhaust stroke. The rise in pressure amounts to about 3.5 lb. per sq. in.

Two power diagrams are also shown, of which one was taken at 600 r.p.m. and the other at 1800 r.p.m. The conditions are otherwise substantially the same. It will be noticed that the low-speed diagram is absolutely smooth, while the high-speed diagram shows a wavy formation just before and after the point of ignition. The statement was made by a speaker at an S. A. E. meeting some time ago that the flicker of the manograph light near the point of ignition, which had always been supposed to be due to inertia of the moving parts, was in reality due to complicated chemical



Exhaust side of American sleeve valve engine

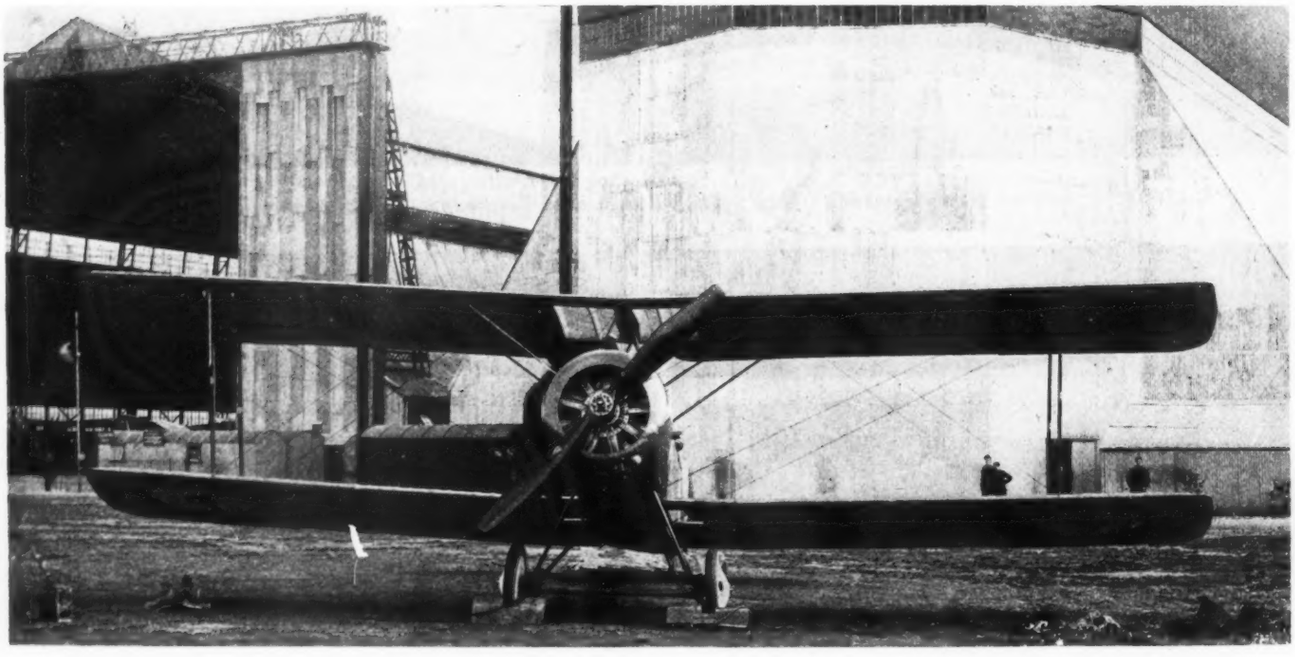
actions during the combustion within the cylinder. This was quite interesting, but it would have been still more interesting if proof had been put forth to substantiate it. If the combustion involved several successive chemical reactions, involving heat liberation at different rates, we would probably have the wavy line also when the engine runs at low speed.

Another point brought out by a comparison of these two diagrams is that at high speed the engine does not get rid of the spent gases nearly as promptly as at low speed. A thing that is more difficult to explain is the more nearly straight compression line in the high-speed diagram.

A horsepower diaphragm of the engine is included in the illustrations. This shows an output of 26 hp. at 1000 r.p.m., corresponding to a brake mean effective pressure of 82 lb. per sq. in., and 50 hp. at 2100 r.p.m., corresponding to a b.m.e.p. of 76 lb. per sq. in. Ignition during these tests was by a Bosch magneto, and the carbureter used was a Zenith.

The engine complete weighs 581 lb. That it is of rugged construction may be seen from the photographs and drawings.

Sopwith Rhino Two-Seater Fighter



The Theoretical Indicator Diagram

A Method of Predetermining the Gas Temperatures and Pressures for Various Points in the Engine Cycles from the Chemical Composition of the Charge and the Physical Properties of the Components

By O. A. Malychevitch, E. S. A., C. M.

THERE has always been an important discrepancy between the temperature and the pressure of the exploding gas in an engine cylinder as obtained by actual measurement and the values arrived at by calculation based on the heat content of the fuel in the charge and the specific heat of its components. In fact, while the theoretical combustion temperature is often given as more than 4000 deg. fahr., the actual combustion temperature is only about 3000 deg. fahr. If the theory was complete and took account of every factor affecting the temperature of combustion it should give results comparable with those obtained by measurement. The author of this article endeavors to evolve a theory of combustion that takes into account all of the influences that lower the combustion temperature and to give results in accordance with practical observations.—EDITOR.

ENGINES of airplanes, and especially those of racing cars, serve as models on which new improvements are first tried out. If they prove themselves, the improvements are later on embodied in other types. On the other hand, defects in design are also repeated. Nevertheless, rapid progress has been made in the development of high-speed engines for motor cars and airplanes.

The race for the Grand Prix in France in 1906 was won by a Renault car with an engine of 165 mm. bore and 150 mm. stroke, having a piston displacement of 12,850 cc. (785 cu. in.). This engine developed 100 hp. at a maximum car speed of 135 kilometers per hour (84 m.p.h.). In the race of 1914 the Peugeot engine of 92 mm. bore and 169.5 mm. stroke, having a piston displacement of 4500 cc. (275 cu. in.), developed 110 hp. at a car speed of 170 kilometers per hour (106 m.p.h.). It will be observed that, notwithstanding the great decrease in the piston displacement (65 per cent) the Peugeot engine developed greater power and much higher speed than the Renault of 1906.

The increase in the power of the engine is by no means the only progress made during a period of about eight years. All modern cars equipped with high-speed engines are much lighter in weight, run on lighter tires and consume less fuel and lubricating oil.

Admitting that an improvement in the form of the combustion chamber is obtained by placing the valves in the head of the cylinder, that modern carbureters are very efficient, that the quality of steel used enables high stresses to be borne, and that the details of the engine are considerably improved, one marvels that such a great difference should still be possible between the two above-mentioned types of engine. The reason for this difference is not to be found in improvements of separate parts, nor in better performance of the carbureter, but in the rapid increase in the number of revolutions (*i.e.*, in the linear speed of the piston), and in successful efforts to solve the problems pertaining to the thermodynamical process of motor-car engines. To these two factors is principally due the above-mentioned progress, which enables an engine with decreased piston displacement, and consequently lighter, to produce much greater power.

On the other hand, practical conditions force manufacturers to adopt standard types of engines, and the annual reports of motor car exhibitions show a tendency to limit the number of types of engines and cars, coupled with endeavors to make the types more efficient, more comfortable and economical. The problem of "economical transportation" directs the efforts of engineers to the question of designing a heavy oil-burning engine (Hvid, Scott-Junkers type) for agricultural tractors, trucks and even motor cars and airplanes, and some method must be adopted for developing the best type of engine from the standpoints of durability, flexibility and other desirable qualities.

A method which may be recommended is that of the experimental investigation of thermodynamic processes in the laboratory as well as in the factory, for different kinds of engines. The data obtained, arranged by such an authoritative body as the S. A. E., could be passed to the drawing rooms of the factories, to serve as a basis in the design of engines. Such data as volumetric efficiency, suction, explosion and exhaust temperatures and pressures of engines using different compression ratios, running at different speeds, etc., will serve in laying out the theoretical indicator diagrams. The latter, when compared with the real indicator diagrams of the completed engines, will serve as a check on the calculated temperatures, pressures, heat losses, coefficients, etc.

From a series of indicator diagrams taken from different types of engines, a mean indicator diagram may be constructed which will permit of a more accurate determination of necessary data, including the values of n_1, n_2, T (equation 40 and (equation 9); and of the development of an engine more efficient than any of those experimented with. The writer may repeat what he said in his article "Gear Box Design" in *The Automobile Engineer* for November, 1915, that "the information which is given here has no absolute significance, as it is based purely on the comparative method. This method enables us, by a detailed study of the existing examples, to evolve fresh ones of more perfect type."

In motor car and aviation engines we deal with a working mixture of air and gasoline (naphtha and kerosene in other types of engines) previous to combustion, and with burned gases after combustion. The determination of conditions of the burned gases, that is, the investigation

of the process of burning itself, in the engine cylinder from the moment when the working mixture is drawn in until the moment the spent gases are exhausted from the cylinder, is one of the most important problems. It is necessary to bear in mind the different factors influencing this process.

1. Those most familiar to the designer are: Shape of combustion chamber, cooling, location of spark plugs, valve timing, etc. Problems relating to these factors are mastered by the designer at the present stage of engine development.

2. The factors which are fairly well understood but which, nevertheless, require further investigation and improvement, include the volumetric efficiency, thermal and mechanical efficiency, suction temperature.

A third group of factors influence the burning process and the conditions of the burnt gases. To this group belong

3. Composition of working mixture, composition and specific heat of burned gases, the change of the number of gas molecules.

Volumetric Efficiency

It is impossible to obtain working conditions that would allow the burned gases to be completely removed from the cylinder and a fresh mixture at 0°C and a pressure of 1 atmosphere to fill the whole volume of the cylinder for the suction stroke.

The realization of such conditions is prevented by the resistance which the mixture encounters in passing through the pipes and valves before it enters the cylinder. This is illustrated by Table 1* containing data of an actual test of a 200-hp. aviation engine, showing the vacuum in the inlet pipe at different speeds of revolution.

TABLE I

		Suction in Inlet Pipe	
R.p.m.	Hp.	Mm. of water	In.
1510	248	240	9.5
1510	234	420	16.5
1450	205	750	29.5
1360	163	1400	55.0

*Le Moteur a Explosions by Rene Devillers.

The back pressure of the remanent gas in the combustion chamber, the temperature of the fresh mixture and possibly the fact that the inlet and exhaust gases flow in a series of waves and not in a steady stream, tend to keep down the amount of charge entering. The length of the wave depends on the length of the inlet pipe and does not always correspond to the period of the opening and closing of the valves. The closing of one of the valves causes the formation of a reverse wave in the inlet pipe, analogous to the wave of a stream of water inside a pipe which is suddenly stopped by a check. The pressure created in this manner depends on the length of the wave and the velocity of the gas at the moment of closing the valve.

Values Obtained by Experiment

High speed engines possess a great advantage in this respect, as there is a possibility of making use of the inertia of the gas in the inlet pipe.

The reduced m.e.p. at the maximum engine speed as compared with the m.e.p. at low and medium speeds, prevents to a great extent any dangerous disturbance of gases in the inlet pipe and produces at the same time the necessary filling of the cylinder at the time when the maximum power of the engine is required.

Theoretically the volumetric efficiency (at P_o and T_o) may be as high as $\eta_e = 0.82$. In practice, the volumetric efficiency generally does not exceed 65 per cent.

Experiments made by Prof. Riedler with three types of engines gave the following figures:

TABLE II

Engine	R.P.M.	Thermal Efficiency	Volumetric Efficiency
Daimler-Knight	1920	20%	69%
96 x 130.....	(500—2100)	(18.5—21.5)	(88—65)
Daimler-Knight	1920	16.57%	58%
101.6 x 129	(500—2100)	(16.0—19.4)	(81—52)
Adler	1920	22%	64.5%
86 x 135	(500—2100)	(18.0—22)	(78—62)

Theoretical Thermal Efficiency

The theoretical thermal efficiency of the four-cycle engine is usually expressed by the formula:

$$\eta_t = 1 - \varepsilon^{n-1} \qquad (1)$$

in which ε = compression ratio, i. e., the ratio

$$\frac{V_h + V_c}{V_c} \text{(Fig. 2)}.$$

$$n = \text{ratio } \frac{C_p}{C_v} = 1.30 - 1.40.$$

C_p = specific heat at constant pressure.
C_v = specific heat at constant volume.

The thermal efficiency depends upon the compression ratio and n, but does not depend upon the temperature.

In this case the specific heat is supposed to be constant, i. e., there is no loss of heat; the expansion continues during the whole stroke and the charge consists of pure air. These conditions, of course, differ from those of actual practice. The specific heat of the working mixture increases with the increase of temperature; C_t (specific heat at constant volume) is not constant, but changes so the value of n changes and the thermal efficiency declines.

This change of specific heat is one of the most important points the designer must deal with.

The working mixture and exhaust gases consist of a number of perfect gases, including O_2, N_2, H_2 and CO; of carbon dioxide (CO_2) and of water vapor (H_2O). Of all the perfect gases CO_2 exhibits the greatest increase in specific heat with a rise in temperature; of H_2O the increase of the specific heat is still more rapid, therefore, the presence of CO_2 and H_2O will change to a great extent the specific heat of the working mixture, diminishing the value of the b.m.e.p. as well as the explosion temperature and pressure. As a result of experiments we assume a linear relation between the specific heat at constant volume and the temperature of the gas.

The maximum temperature of combustion depends on the strength of the mixture (air-gasoline ratio) and on the temperature of the entering charge. The change in the specific heats at high temperatures causes a loss of heat. There is loss of heat to the cylinder jackets, which depends to a certain extent on the number of revolutions of the engine. A high-speed engine has an advantage in this respect as the loss due to cooling is a function of the time, and the reduced time of cooling reduces the percentage of heat loss.

Therefore, the average loss due to the change of specific heat (17 per cent) to the cylinder jacket (16 per cent) and delayed combustion (3 per cent) in such a case amounts to about 36 per cent and the maximum possible thermal efficiencies for different compression ratios are:

Compression ratio	$\eta_t = 1 - \varepsilon^{n-1}$	Theoretical thermal efficiency
4 :1	38.4%	25%
5 :1	43.1%	27.6%
6 :1	46.6%	30%

It follows from the above table that the theoretical thermal efficiency for a compression ratio of 5 amounts to only 63.5 per cent of the air cycle efficiency (equation 1) although in practice it rarely surpasses 24 per cent (for $\varepsilon = 5$).

One of the principal aims in designing the engine, is to diminish the weight and increase the power. By reducing the weight of the flywheel, pistons and connecting rods, increasing the compression ratio and modifying the valve timing, we may increase the power, sometimes by 50 per cent, and diminish at the same time the noise and wear. The mechanical efficiency limits the speed of revolution of the engine, and as an increase in speed increases the power it is very important to determine the mechanical efficiency by experiment. The following valuable diagram made by Prof. Walter Fishleigh* gives the value of mechanical efficiency as 0.62-0.85 for a 6-cylinder, 4⅛ x 5¼-in. engine at 640, 1,000 and 1,350 r.p.m. (Fig. 1).

The remaining factor of group 2, the inlet temperature, we will consider together with group 3 factors.

Coming now to the determination of the necessary data for constructing the theoretical indicator diagram,† we must first analyze the combustion process itself.

Prof. W. E. Grinevetzky of the Moscow Technical Institute, in his editorial supplement to the Russian translation (1907) of Güldner's Internal Combustion Engine, using the kilogrammolecule (kg.mol.) for the working mixture and burnt gases and taking as a base the molecular mean specific heat of gases, developed the formula for calculating the explosion temperature. The writer has applied the suggestion of Prof. Grinevetzky in calculating and constructing the theoretical indicator diagram of an engine, which gives sufficient knowledge of the relation of all factors of the working process and serves afterwards as valuable material for comparison with the real indicator diagram. Therefore, we will express the amount of the working mixture and burnt gases in kg. mol., taking as a unit the number of kilograms equal to the molecular weight of the gas.‡ By Avogadro's law, equal volumes of all gases at the same pressure (density) and temperature, contain the same number of molecules, i. e.,

1 gr. mol. of gas = 22.330 liters.
1 kg. mol. of gas = 22330.00 liters.

Such a unit contains a given number of molecules for equal volumes of all gases. The use of such a unit is very practical and identical to the measurement of volume.

The amount of air required to burn one kilogram of fuel, in kg. mol., is $A/28.89$, where 28.89 is the weight of a kg. mol. of air (this is also the molecular weight of air). The total number of kg. mol. of working mixture previous to combusion is

$$\frac{A}{28.89} + G$$

where G is the number of kg. mol. of the evaporated part of fuel, which may be considered as equal to zero, because the quantity of evaporated fuel drawn into the cylinder before the combustion may be taken as negligible. Therefore, we may say, that the total number of kg. mol. of working mixture will be:

$$\frac{A}{28.89}$$

Besides the fresh working mixture drawn into the cylinder, there is a certain quantity of burnt gases remaining from the previous explosion.

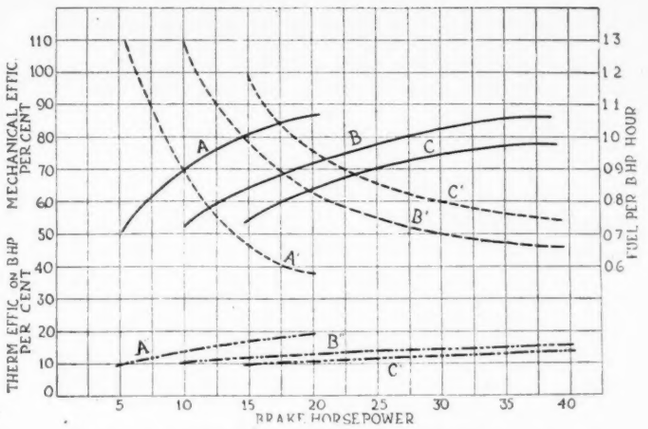


Fig. 1—Mechanical and thermal efficiencies at three different speeds

Engine 6 cyl. 4⅛ x 5¼" L head type

A, A', A"—Mech. eff., fuel cons. and b.h.p. therm. eff. at 640 r.p.m.
B, B', B"— " " " " " 1000 r.p.m.
C, C', C"— " " " " " 1350 r.p.m.

Assume that ψ is the ratio of the number of kg. mol. of remanent gases to the working mixture, or the ratio of their volumes at equal pressure. Hence the total number of kg. mol. of gases in the cylinder previous to combustion is

$$\frac{A}{28.89}(1 + \psi) \qquad (2)$$

Knowing the values of A and ψ, we may determine the quantity of gas previous to the combustion, and from the reactions of the combustion, we find the quantity and the composition of the burnt gases.

The working mixture and exhaust gases consist of perfect gases (di-atomic), including oxygen, nitrogen, hydrogen and carbon monoxide; of carbon dioxide and water vapor.

As the specific heats of the different gases are affected differently with an increase in temperature, let K_1, K_2 and K_3 be the numbers of kg. mol. of these three components of burnt gases obtained from 1 kg. of fuel. We assume a linear relation between the specific heat at constant volume and the temperature of the gas, and base our calculations on the mean specific heat of gases for changes from 0° abs. to the given temperature.

The molecular mean specific heat at constant volume may be represented by the following equations:

$$\left.\begin{array}{l} \text{For perfect gases} \ldots\ldots C_{v_1} = 4{,}625 + 0.00053\,T \\ \text{For } CO_2 \ldots\ldots\ldots\ldots C_{v_2} = 6{,}774 + 0.00189\,T \\ \text{For } H_2O \ldots\ldots\ldots\ldots C_{v_3} = 6{,}855 + 0.00116\,T \end{array}\right\} \quad (3)*$$

The specific heat of masses of burnt gases from 1 kg. of fuel will be (equation 3).

$$C_{mv} = K_1 \times C_{v_1} + K_2 \times C_{v_2} + K_3 \times C_{v_3} \qquad (4)$$

Substituting in equation (4) the value of C_{v_1}, C_{v_2}, C_{v_3} from equation (3) and K_1, K_2, K_3 we obtain the form of equation

$$C_{mv} = L + MT \qquad (5)$$

As besides the working mixture in the cylinder there were some dead gases (equation 2) the total specific heat—

*From a paper on Heat Balance Tests of an Automobile Engine, read at S. A. E Meeting.

†The theoretical indicator diagram of the process AEZC (Fig. 2) compression and expansion follow the lines AC and EZ according to the equations $Pv^r = \text{const.}$, *i.e.*, polytropic.

‡A given body may be divided both chemically and mechanically. The infinitesimally small particles of an elementary material that can be divided no further either mechanically or chemically, are known as atoms. It is assumed that in any given material these atoms are closely associated in certain groups, and such smallest possible atom groups into which the material can be subdivided without affecting its chemical constitution, are called molecules. In other words, a molecule is the smallest weight necessary to enable a substance to maintain its identity, while the atom is the smallest conceiveable weight with which the chemical elements form combinations.

*At the constant pressure:

$$\left.\begin{array}{l} \text{for perfect gases} \ldots\ldots C_{p_1} = 6.600 + 0{,}00053T \\ \text{for } CO_2 \ldots\ldots\ldots\ldots C_{p_2} = 8{,}749 + 0{,}00189T \\ \text{for } H_2O \ldots\ldots\ldots\ldots C_{p_3} = 8{,}830 + 0{,}00116T \end{array}\right\} \quad 3A$$

$$C_{mp} = K_1 \times Cp_1 + K_2 \times Cp_2 + K_3 \times Cp_3 \ldots\ldots 4A$$

$$C'_{mv} = C_{mv}\,(1+\psi) \tag{6}$$

or

$$C'_{mv} = (L+MT)\,(1+\psi) \tag{7}$$

Let Q be the heat liberated on burning 1 kg. mol. or 1 kg. of fuel. The heating value of one kilogram of gasoline $H_g = 10{,}500$ cal., hence,

$$Q = \varphi\, H_g \tag{8}$$

$\varphi = 0.65 - 0.75$; $\varphi_{c_1} < 1$ on account of incomplete combustion, loss of heat to the cylinder walls and partly on account of dissociation and delayed combustion.

With a high degree of accuracy, from the practical point of view, we may say that the heat Q added to the gases during the working stroke changes the condition of the gases (at constant volume or constant pressure) from temperature T_c to temperature T_z; therefore, for bringing the burnt gases from temperature T_z to temperature T_c (at constant volume or constant pressure) it is necessary to abstract a quantity of heat Q from them. This we can express by the equation—

$$-Q = (1+\psi)\,(L+MT_c)\,T_c - (1+\psi)\,(L+MT_z)\,T_z$$

Inserting the value of Q from equation (8) we get:

$$\varphi\, H_g + (1+\psi)\,(L+MT_c)\,T_c = (1+\psi)\,(L+MT_z)\,T_z \tag{9}$$

Equation (9) enables us to determine the explosion temperature T_z, taking into account all possible factors of the working process.

The explosion temperature T_z is usually determined from the estimated value of the explosion pressure P_z, i. e., the factor which ought to be calculated in the most precise way and not guessed at.

The coefficient ψ in equation (9) may be calculated (see equation 22) and is quite small.

The compression temperature T_c is found by equation (14).

Coefficient φ has to be determined from a series of indicator diagrams from different types of engines, from which it may be calculated with a sufficient degree of accuracy. For motor car engines the writer takes $\varphi = 0.65 - 0.75$.

In Diesel engines $\varphi = 0.90 - 0.92$, due to the practically complete combustion and favorable shape of the combustion chamber.

During combustion, due to the evaporation of fuel and the formation of CO_2 and H_2O, the number of gas molecules changes and the volume of 1 kg. of burnt gases also changes.

Now assume that the coefficient of molecular changes δ is the ratio of the number of molecules in the burnt gas to the number contained in the working mixture; then by Charle's law we get

$$R_2 = \delta\, R_1 \tag{10}$$

where R_1 = constant for working mixture.
R_2 = constant for burned gases.

If dK kgmol. be the total change of gas molecules during the combustion, equation (2) may be written:

$$\frac{A}{28.89} + dK \text{ kgmol.} \tag{10A}$$

and

$$\delta = 1 + \frac{dK}{\dfrac{A}{28.89}\,(1+\psi)} \tag{11}$$

The inlet temperature of the gases, T_a, may be calculated by the equation:

$$T_a = T_o \frac{\varepsilon \times p_a}{\eta_e\,(\varepsilon - 1) + \left(\dfrac{T_o}{T_r}\right) p_r} \tag{12}$$

where

p_a = suction pressure
p_o = 1 at. initial pressure of gas
T_o = 290° abs. initial temperature of gas
η_e = 0.82 volumetric efficiency.
p_r, T_r° abs. pressure and temperature of exhaust gases remaining in the clearance space.

(To be continued)

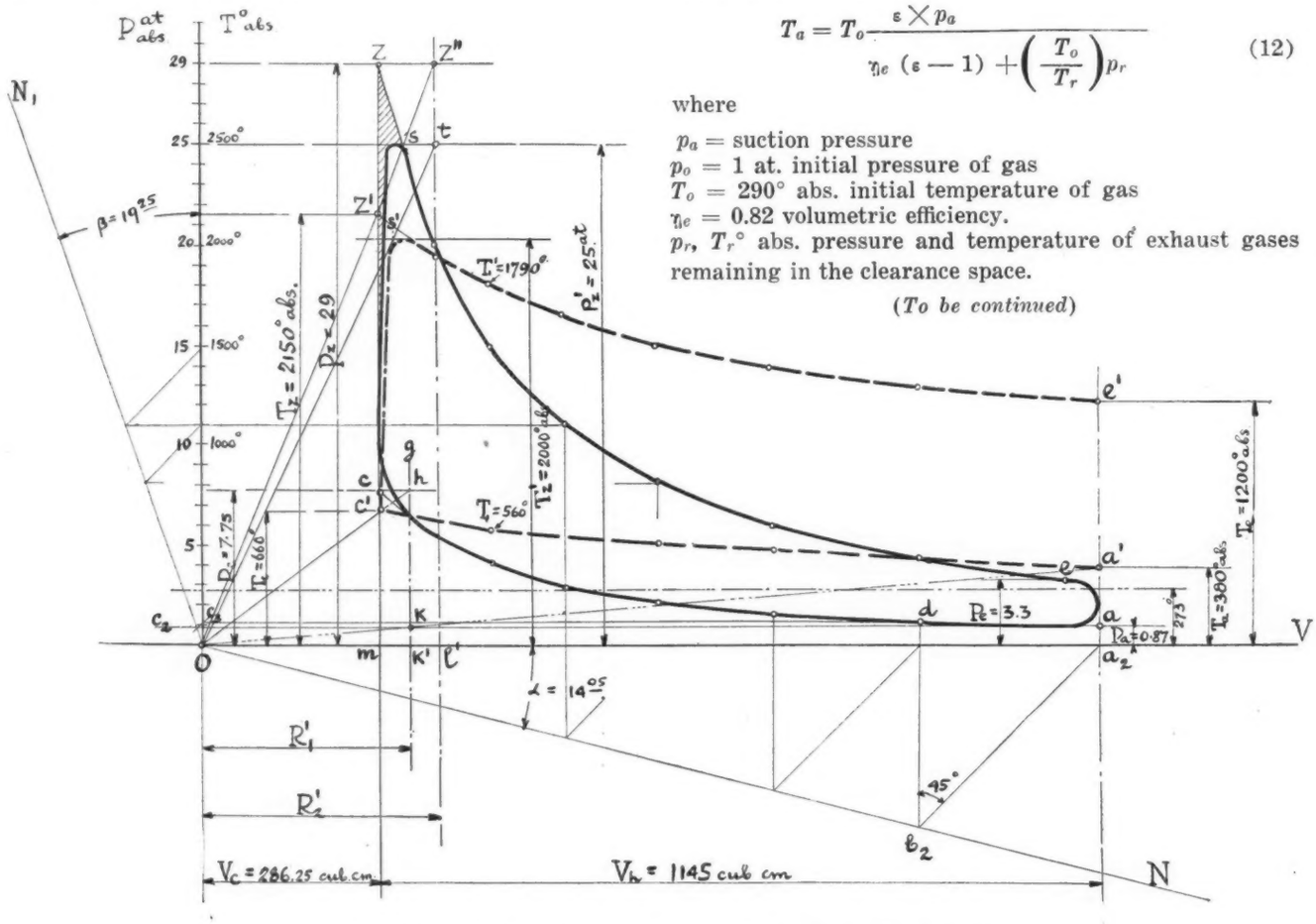


Fig. 2—Illustrating the construction of a theoretical indicator diagram

The Pfalz Single-Seater Fighter*

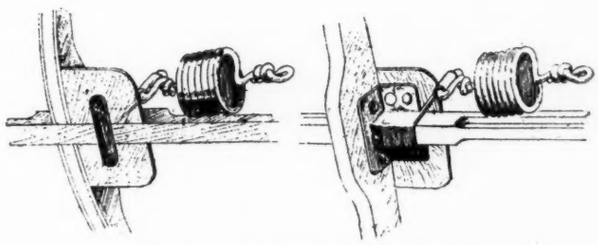
PART III

Seating Arrangement—Aileron, Elevator and Rudder Controls—Landing Gear

THE seating accommodation of the Pfalz does not present any special features, except, perhaps, that the pilot's cockpit is quite roomy considering the area of the cross section at this point. This is, of course, a consequence of the peculiar body construction, which, for a given cross section, leaves more space inside than is possible when employing the girder type fuselage with rectangular main structure and the fairings added afterwards. Thus, in the case of a circular cross section, for a diameter of 3 ft. the inscribed square is only about 2 ft., while with the monocoque construction the whole circle is available for the accommodation of the pilot. This is another way of saying that the cross sectional area of a body of rounded section can be kept smaller with monocoque construction than with girder-cum-fairing construction, resulting in lower head resistance.

The seating itself is of the usual type. The front edge of the seat is supported on the sloping former, while the rear of the seat rests on a transverse member supported on a small false former slightly farther aft. Needless to say, the pilot is equipped with a safety belt, which in the Pfalz is in the form of webbing, attached as shown in the illustration, to the longerons through a short length of coil spring.

*From *Flight*.

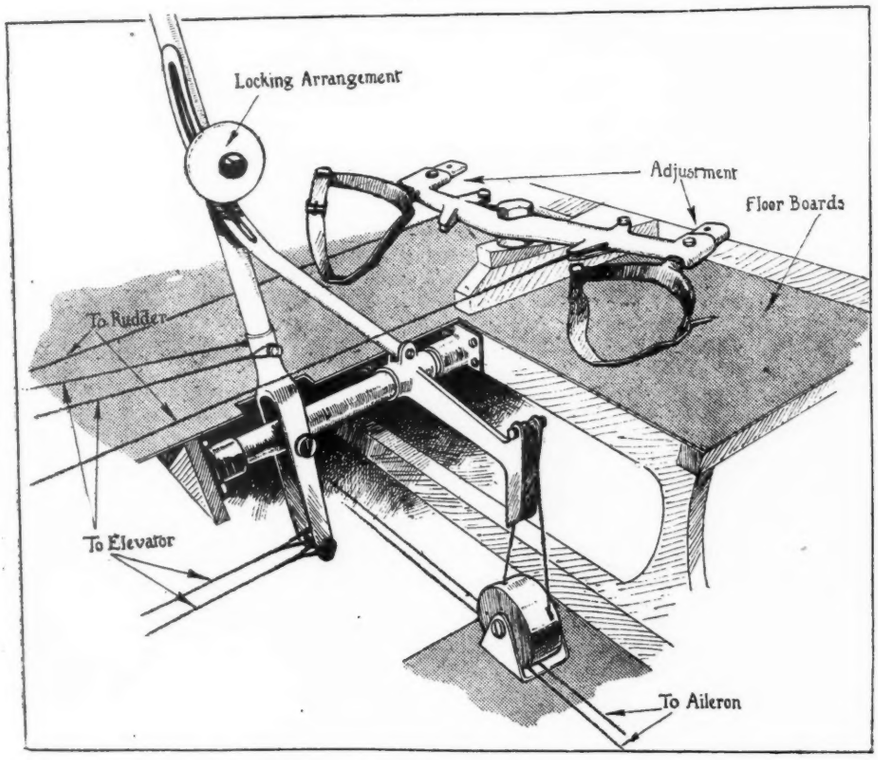


Sketches of safety belt attachment

The Pfalz controls are shown in one of the sketches. A tubular control lever, forked at its lower end, is attached to a longitudinal rocking-shaft, which carries at its front end the transverse cranks for the aileron controls. In connection with these it should be remembered that ailerons are fitted to the top plane only, hence two cables pass from each end of the crank and around pulleys, one of them being what might be termed the positive cable, running through the lower plane, over pulleys, and to the aileron crank; the other being the return or equalizing cable running across the body through the opposite lower plane, over a pulley, and to the opposite aileron.

As is now general practice, means are provided for locking the elevator in any desired position. In the Pfalz (see cut) the collar carrying the aileron control cranks has welded to it a vertical forked lug, a bolt through which forms the pivot for a hinged stay rod, terminating at the top in a flat, curved, slotted strip, which may be locked in any position by means of a locking disc of aluminum. At its upper end the control column has welded to it two handles, bound with cord, of which the left is rotatable and operates the throttle, much after the fashion of a motorcycle. Centrally placed are two triggers operating the two synchronized machine guns through Bowden cables. A sketch is shown of the handle. This sketch, it may be pointed out, has been drawn from the port side in order to better show the twisting handle, while the general sketch of the controls is drawn as seen from the starboard side.

The rudder bar of the Pfalz presents some rather unusual features. Thus the rudder cables are anchored to forked lugs on the front of the foot bar, through which they pass, and issue from the rear of the bar through



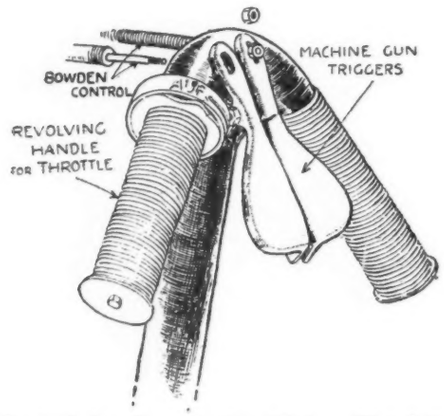
Perspective drawing of Pfalz controls

channel section guides which act, when the foot bar is moved to the extremity of its travel, as quadrants for the cables. The object of this rather complicated arrangement is not clear, unless it has been done in order to get the forked lugs working in compression instead of in tension. The foot rests are in the form of flat forks inserted in sockets in the foot bar and provided with adjustment for length to suit individual pilots.

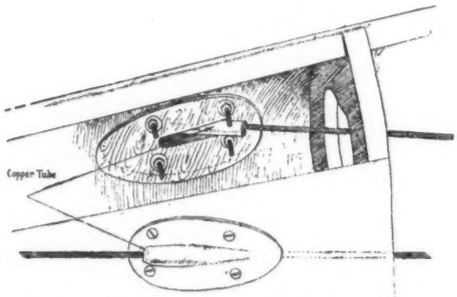
Where the rudder and elevator cables issue from the interior of the body they pass through small sheet steel plates carrying a steel tube fitted with a copper tube line to protect the cables against wear.

Engine a Mercedes 160

The engine, a 160-hp. Mercedes, is mounted in the nose of the body on two longitudinal bearers supported by four main formers. The details of the mounting do not call for any comment, and the general arrangement of the engine mounting will be sufficiently clear from illustrations in previous instalments. The main fuel tank is carried in the bottom of the body, resting on the spar roots of the lower plane built into the body as a permanent fixture. The usual hand-operated pressure pump and an engine-driven pump are provided for forcing the gasoline from the main tank up into the service tank built into the top plane. The oil tank is carried by the side of the engine. The nose of the machine is rounded off, and terminates in a "spinner" fitted over the propeller boss, thus forming a very smooth entry for the air. Near the nose of the machine there are two scoops, that on the port side carrying air into the engine housing, while the scoop on the starboard side has a tube running to an opening in the crankcase, which is ventilated by this means. These features, as well as the neat inspection doors provided in convenient places on the front part of the body, are illustrated herewith.



Control handles of the Pfalz. The left-hand handle is rotatable and operates the throttle through a Bowden wire



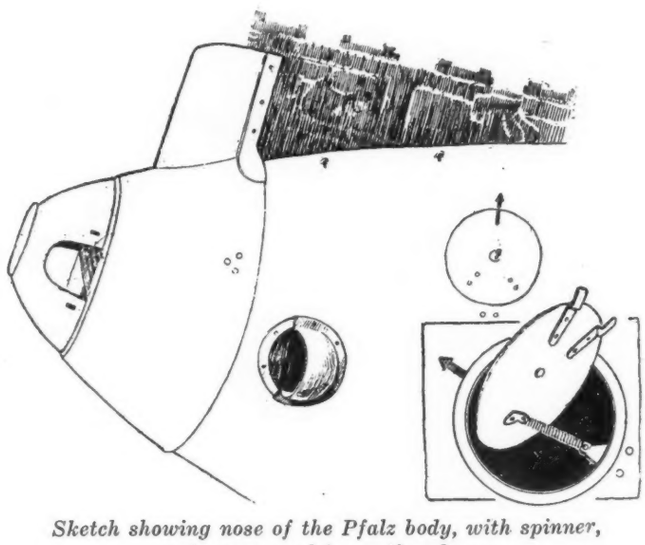
Guide tubes for the rudder and elevator control cables

The undercarriage is of the Vee type, with struts of stream line section steel tube. The struts look somewhat spidery, being of rather small dimensions as regards their section. The major axis of the section is 1.89 in., and the maximum thickness of the strut, occurring fairly far back, is 1.18 in. The fineness ratio is therefore very low. The attachment of the chassis struts to the body is of interest. The rear struts are bolted (see cut) to an I section steel bracket built into the wing roots on the body. Thus the landing shocks are transmitted from this strut through the bracket to the fixed rear spar and its former, and to the sloping former surrounding the pilot's seat. The upper ends of the front struts are welded to elongated base plates of heavy gage, which serve as lugs for the chassis bracing cables. In order to distribute landing shocks over a larger area a steel band is passed underneath the bottom of the body, so that the whole bottom part of the former to which the struts are attached rests in the loop of this strap.

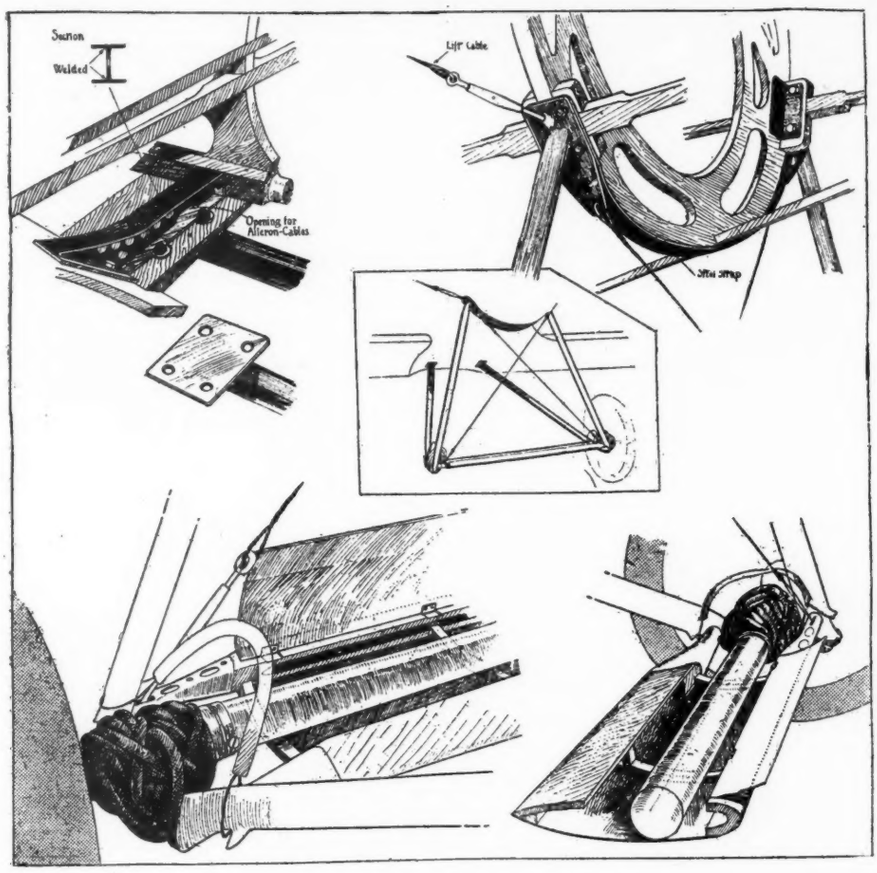
Landing Gear Cross-Braced

The apices of the chassis Vees are connected by two cross struts, one in front and one behind the axle. As a matter of fact, it is hardly correct to term the rear one a strut, as it consists of short lengths of solid wood tapered to fit the steel socket attaching it to the chassis struts, the remainder of its length being made up of a thin strip of wood forming the top surface of the trailing edge, while its bottom surface is in the form of a sheet of three-ply passing under the axle to the front cross strut. The latter is a wood strut spindled out to a "D" section, and tapered at the ends to fit the tapered steel sockets which connect it by means of bolts to the chassis struts. The top of the stream-line casing around the axle thus formed is a hinged lid of aluminum, which, as the axle moves up and down when the machine is running along the ground, opens and closes, lying, of course, snugly against the rear cross strut when the axle is relieved of its load as the machine leaves the ground, thus forming a good stream-line section with, it is to be presumed, a fairly low head resistance. Cross bracing of the chassis is in the front bay of the struts only, and is in the form of stout stranded cable. As in the case of the wing cables, no stream lining has been attempted, a feature fairly typical of German machines of even modern design.

The shock absorbers are in the form of cords which,



Sketch showing nose of the Pfalz body, with spinner, air scoop and inspection door.



General view and details of Pfalz landing gear

as regards outward appearance, might easily be mistaken for rubber cord, but which on closer examination are found to be spiral springs, one inside the other, enclosed in a woven cover similar to those employed for covering stranded rubber cords. These springs are wrapped around the apex of the chassis Vee and around the axle, and are prevented from slipping up along the chassis struts by lugs welded to the struts. Two lugs higher up serve as anchorage for the short loop of stranded cable which limits the travel of the axle. This length of cable is enclosed in a cover to protect it against wear. The tubular axle is a fairly large diameter—2.16 in., to be exact; but we have not been able to ascertain of what gage the tube is made. The details of the undercarriage are shown in the perspective sketches herewith.

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An Instrument for Testing Permanent Magnets

THE magnet-meter, marketed by Herman A. Holz, Metropolitan Tower, New York City, is an instrument designed for testing permanent magnets of horseshoe or U shape for their total flux and for their coercive force. Flux and coercive force tests may also be made with the well-known instrument known as the permeameter, but the latter is not designed for, and cannot be satisfactorily employed in, determining whether or not magnetized shapes satisfy definite requirements.

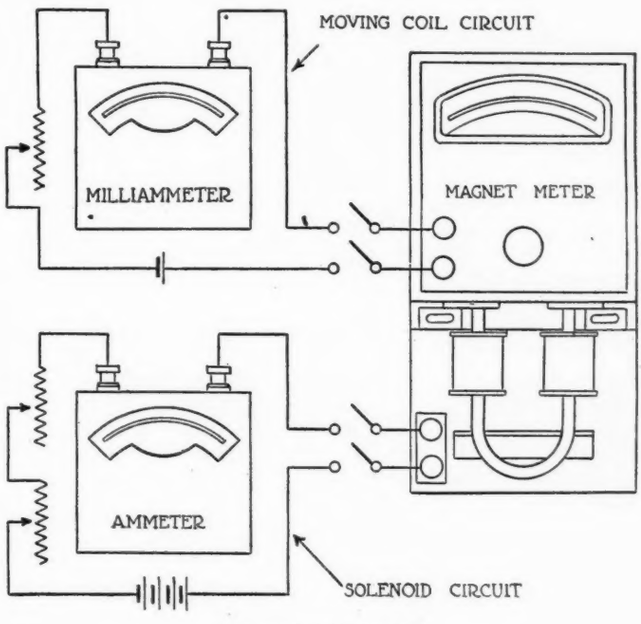
A diagrammatic illustration of the magnet-meter is shown herewith. The principle of operation may be briefly described as follows:

A coil capable of rotary movement, to which is attached a pointer, traversing a calibrated scale, is supported between two specially shaped iron pole pieces. This movable system and scale are enclosed in an air-tight housing. The pole pieces are extended through the housing into contact faces or plates, to which the polar portions of the magnet under test are applied. When a definite current is allowed to flow in the moving coil, a deflection of the pointer occurs which is proportional to the flux in the magnet applied to the contact faces.

In measuring the coercive force of the magnet, two adjustable solenoids are employed, which are located in front of the contact faces so as to encircle the respective legs of the test magnet. If current is allowed to flow in the proper direction through the windings of these solenoids, when the pointer is deflected in reading the flux, the deflection may be reduced to zero by regulating the current. The value of the current flowing when there is no flux is a direct measure of the coercive force.

Measurement of the flux does not affect the magnetization of the magnet under test, and this measurement therefore may be applied to every magnet in a lot. On the other hand, the measurement of the coercive force involves demagnetization of the specimen, and the latter has to be remagnetized after the test. In consequence the coercive force test would be applied only to a number of selected specimens.

Current for the moving coil is supplied from a dry cell and the current for the solenoids from a 6 or 12-volt storage battery. Contact shoes are provided to permit of ample contact between the polar portions of the test magnet and the contact plates, in cases where the ends of the magnets are finished. No bushings are required to adjust the instrument for testing different sizes of magnets. The standard apparatus accommodates magnets of horseshoe type of any section of material up to 17/32 in. in thickness and 2 in. in width, with a minimum gap of 1 11/16 in. The price of the complete outfit, including the magnet-meter, milli-ammeter, ammeter, three rear staffs and two switches, is $450. The instrument should be of interest particularly to magneto manufacturers.



Magnet-meter outfit

The Nuttall Tractor Transmission

Gives Two Forward Speeds and Reverse—Enclosed in Well Ribbed Cast Iron Housing—May Be Readily Adapted to Different Designs of Tractors

A WELL designed transmission for agricultural tractors is manufactured by the Nuttall Gear Co. of Pittsburgh, Pa. While the transmission is produced in only one size, various changes are made in the design to adapt it to different types of tractors. The transmission is inclosed in a substantial, well-ribbed cast iron housing, so that the shafts are rigidly supported without the whole gear being unduly heavy.

The Nuttall transmission affords two forward speeds and one reverse, speed changes being effected by shifting gears laterally into mesh. The transmission comprises, in addition to the gearing for changing the speed and direction of motion, a power take off for the belt drive and a jack shaft with differential, the whole being inclosed in the cast iron housing referred to. All of the gears are made of forged steel, hardened and ground. All shafts are forged steel, hardened and ground, and all are mounted on flexible roller bearings.

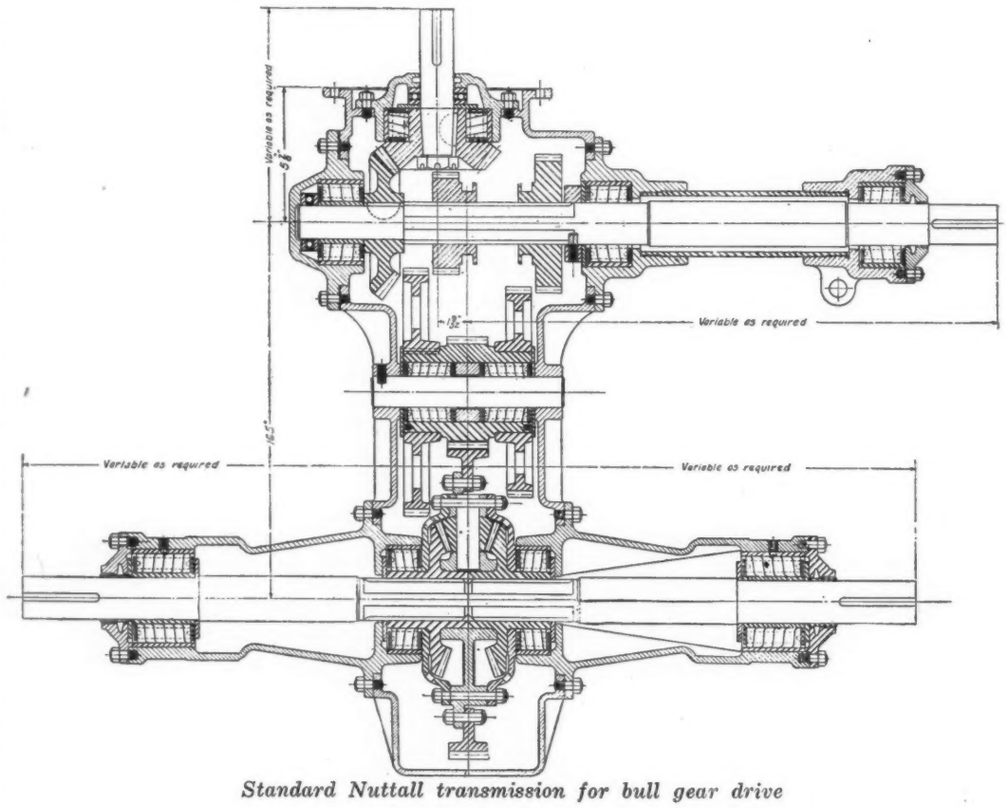
The case in which the gears and differential are carried is a standardized unit, which it is seldom necessary to change in order to adapt the transmission to any particular tractor. The only parts which are somewhat different in transmissions made for different tractors are the bull pinion shaft and the housings which support them, the power shaft, and its housing.

The Nuttall transmission may be used with either a longitudinally or a transversely mounted engine, and the two constructions are illustrated herewith. In one case a short shaft extends into the transmission housing from the front, and carries the bevel pinion, meshing with another bevel pinion on the splined shaft, whereas in the other case the splined shaft extends entirely through the housing and is provided at its outer end with a sprocket wheel, or connected directly to the engine, as the case may be. With either type of engine the transmission may be mounted either in a horizontal plane or in an inclined plane. It is possible to provide the front end of the case with a bell housing, which may be connected directly to the engine bell housing, thus making of the engine and transmission a unit power plant. This arrangement is particularly desirable where a disk clutch is used, as this makes absolute rigidity necessary.

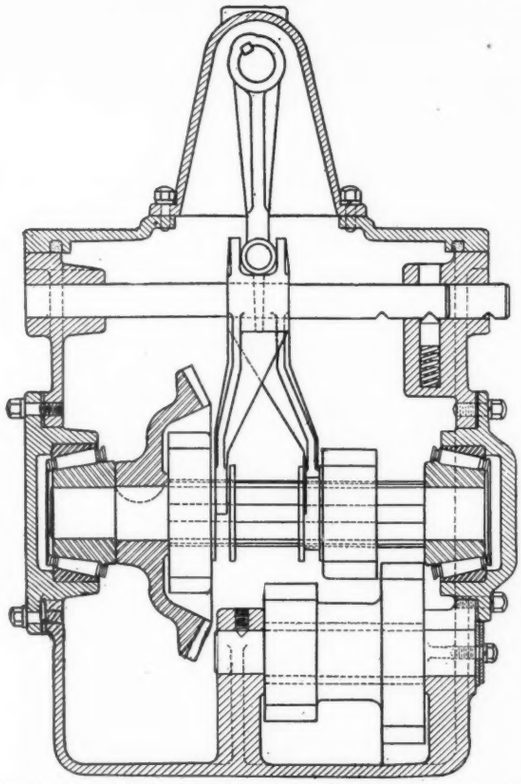
Although designed for 3-4 plow tractors, which are generally equipped with engines of 15-30 hp. ratings, the Nuttall transmission is claimed to be well able to transmit 42 hp. at 800 r.p.m. of the engine. Its average weight is 500 lb. The bearings which carry the power shaft are interchangeable end for end, which permits of the power shaft extension being placed on either the right hand or the left hand side. Where the front drive arrangement is used, that is, with a longitudinally mounted engine, slight variations in speed are possible, which are obtained by changing the number of teeth in the bevel gear and pinion. The design also permits of placing the bevel gear on either the right hand or left hand side of the bevel pinion, thus permitting the use of either an internal or external bull gear.

Some tractors have single wheel drives, and these do not require a differential gear. In this case only one bull pinion shaft is used, to which is keyed the main driving gear, and the differential gears are omitted. In the case of a chain drive, sprockets are used in place of bull pinions, but the transmission is mounted the same as for the gear drive.

In the design of the Nuttall transmission, efforts have been made to distribute the load due to gear action among the different bearings as nearly equally as possible, so that no bearings shall be subjected to an excessive load. The shifting mechanism, which works on the selective principle, is provided with a safety lock, making it impossible to have both sets of gears in mesh at the same time. For mounting the transmission on the frame, the housings of the jack shaft are provided with lugs, which can be bolted to the frame, and there is also a lug on the outboard bearing of the power take off shaft.



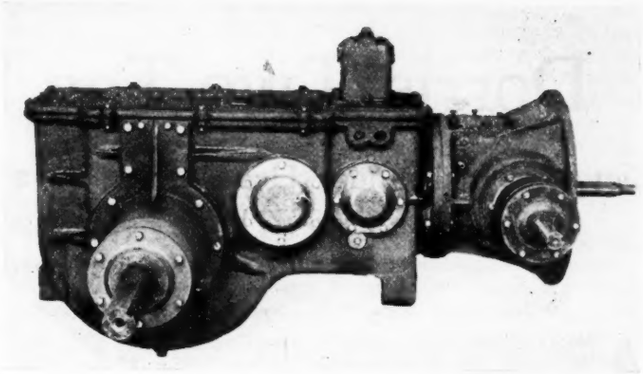
Standard Nuttall transmission for bull gear drive



Vertical section through new Nuttall transmission

Where the engine is mounted cross-wise on the frame, the housings for the jacketshaft on opposite side of the transmission housing are made of unequal lengths, so that the transmission comes close to one side member of the frame. The splined shaft of the transmission is then directly connected to the clutch shaft in line with the crank shaft.

Where the transmission is mounted at an angle fore and aft, or when the tractor is on a grade, there is a tendency for all the oil to flow to the lower end of the case. To prevent this partition walls are cast in the bottom of the case, which hold the oil under each set of gears.



Side view of new Nuttall transmission and rear axle

Quite recently the Nuttall Co. has completed a new tractor gearset intended for tractors pulling three or four plows. The gearset is a live axle design suitable for wheels up to 50 in. in diameter. It gives a gear ratio of 51.8 to 1 on low gear and 36.5 to 1 on high gear. With 50 in. rear wheels this gives a low speed of 2.4 m.p.h. and a high speed of 3.5 m.p.h.

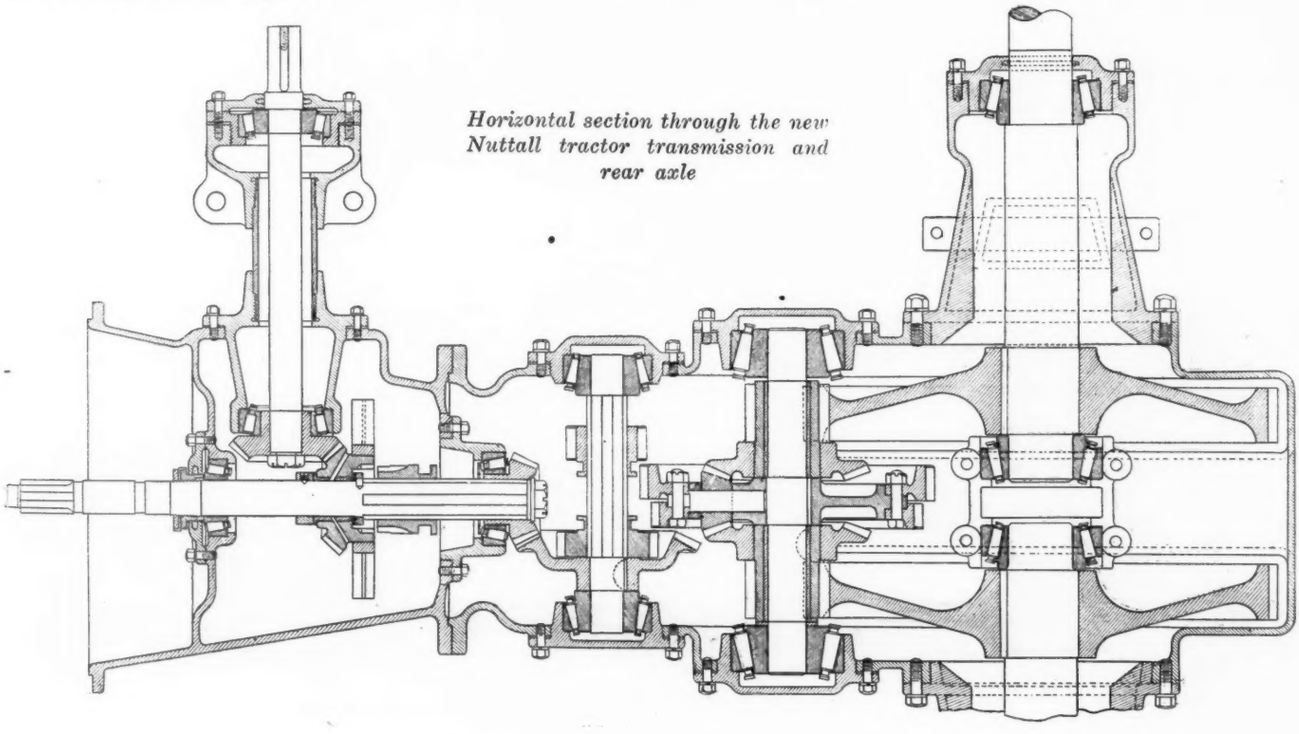
The company is not yet completely tooled up for production on this new job, but in 60 days should be starting production and by Jan. 1 should have an output of 10 per day.

The gearset is a compact design in two parts, the transmission, which embraces the differential and rear axle drive shafts, and the forward end, which has a separate housing enclosing the bevel gears for driving the belt pulley. This separate portion bolts on the forward end of the gear box and has a bell housing end for bolting to the engine crankcase.

All gears are forged, including the large gears on the inner ends of the axle drive shafts, which are hydraulic forgings of 40-50 carbon steel.

The set complete weighs 1385 lbs. and affords three reductions. All shafts are carried on Timken bearings. The set of bevels driving the belt pulley are locked to the longitudinal shaft by a sliding clutch. The pulley shaft, together with its two Timken bearings, is a unit bolting direct into the side of the forward housing. The forward shaft of the gearset is splined and carries the two live gears, the differential being on the secondary shaft which transmits through two large gears on the divided rear axle. These drive shafts are 3¼ in. in diameter.

Horizontal section through the new Nuttall tractor transmission and rear axle



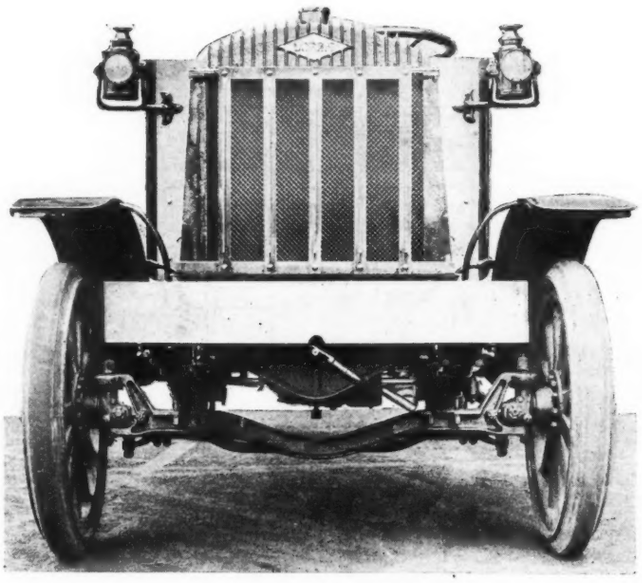
Dorris Two-Ton Truck Model K-4

Detachable Cylinder Head Doing Away with Valve Cages, One of the Novel Features—Three-Point Suspension Used Throughout—Final Drive Through Worm Gear

A NEW 2-ton truck model of the Dorris Motor Car Co., St. Louis, Mo., has reached the production stage. The Dorris company has been building 2-ton trucks since 1911, and, like its previous trucks and passenger cars, the new truck has a valve-in-the-head engine.

What appears to be the principal improvement of the new engine is a detachable cylinder head, which affords greater valve accessibility and eliminates valve cages. With the valve seats directly in the cylinder head, the water can circulate all around them and thus insure adequate cooling of the valves under all operating conditions.

The new engine has a cylinder bore of 4¼ in. and a stroke of 5½ in. This is equivalent to 312 cubic inches piston displacement and to a N. A. C. C. rating of 28.9 hp. On the block the engine is said to develop 38 hp. at 1090 r.p.m. It shows a maximum torque of 175 lb.-ft. One of the notable features of the engine is its five-bearing crankshaft. This has a diameter of 2¼ in. Of the main bearings the four forward ones are 2 in. long each, while the rear is 2 9/16 in. long. The connecting rod bearings also are 2 in. long. All bearings are of the bronze-backed nickel babbitt type and are 3/16 in. thick. The same as the crankshaft, the camshaft is supported on five bearings, and therefore is very rigidly mounted.



Front view of Dorris truck

Aluminum Crankcase

The crankcase is cast of Lynite aluminum alloy and is formed with five heavy ribs to support the main bearings. This design lends itself to a very rigid construction, and it also facilitates adjustment of the bearings. The lower half, which forms the oil well and contains the oil screen, is also cast of aluminum alloy. Helical gears serve for driving the camshaft from the crankshaft, and these are of an exceptional width of face (1½ in.). The valves, located in the cylinder head, have a clear diameter of 1⅞ in. and a lift of 11/32 in. They are made of tungsten steel. To insure positive valve action and at the same time smooth seating under extraordinary conditions of motor load, each valve is provided with two springs.

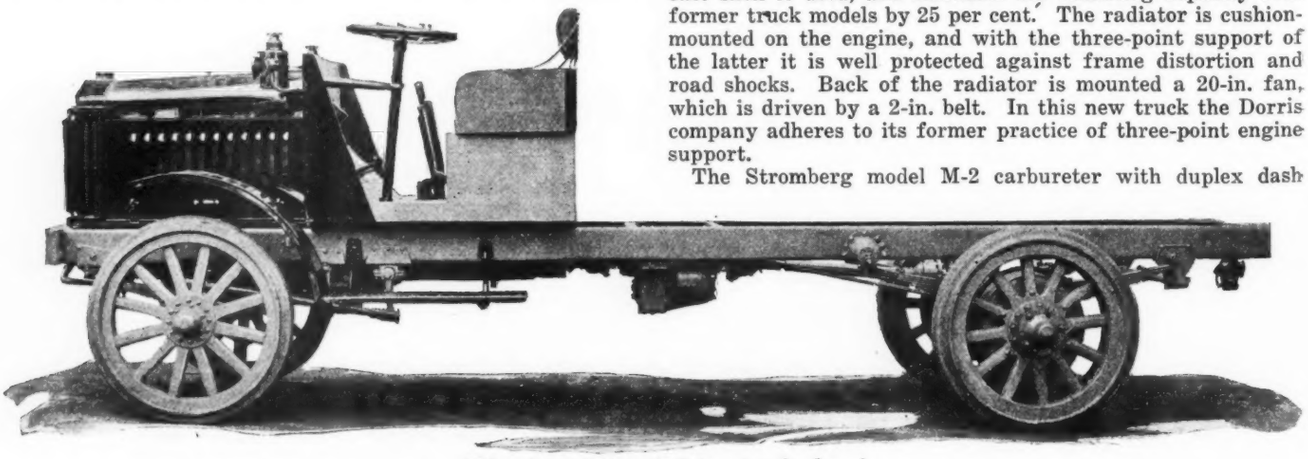
Lubrication is by force feed to all of the main bearings and to the connecting rod bearings, the crankshaft being drilled diagonally for this purpose. A continuous oil bath is provided for the valve mechanism and timing gears. This bath also serves to lubricate the spherical pivot support of the push rods, which latter are adjustable by removing the pressed steel housing covering the rocker arm mechanism.

After experimenting with a variety of engine governors, the Dorris company, in its new K-4 model, has incorporated a governor of its own design, which is built integral with the engine. It is completely enclosed, adjustable and sealable, besides which it is claimed to give perfect governing action and to be trouble proof. The engine speed is governed at 1090 r.p.m., which corresponds to a truck speed of 15 m.p.h.

Three-Point Support for Engine and Gearset

A radiator of the vertical flanged-tube type with large cast shell is used, and increases the radiating capacity over former truck models by 25 per cent. The radiator is cushion-mounted on the engine, and with the three-point support of the latter it is well protected against frame distortion and road shocks. Back of the radiator is mounted a 20-in. fan, which is driven by a 2-in. belt. In this new truck the Dorris company adheres to its former practice of three-point engine support.

The Stromberg model M-2 carbureter with duplex dash



Side view of Dorris 2-ton truck chassis

control and U tube is fitted. In connection with this carbureter is used a hot spot manifold, and easy starting and high fuel economy are claimed.

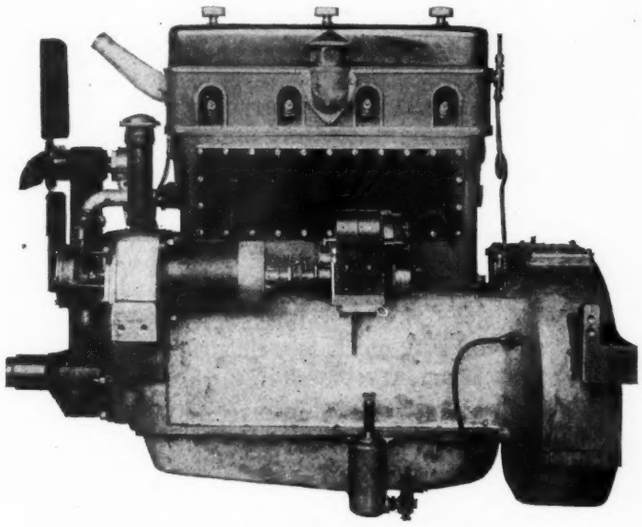
The clutch is of dry-disk type, and is built into a unit with the engine. It comprises seven disks, and affords a smooth, easy clutch action, together with a positive drive under all load conditions. The gear box is of the four-speed type, and is mounted separately amidships, one of the advantages of this mounting being unusual accessibility. Like the engine, the gear box has a three-point support, whereby it is protected from all frame distortion. The gears are made of 3½-in. nickel steel, and the whole transmission is enclosed in an oil-tight case.

From the gear box the power is transmitted to the rear axle through tubular drive shafts, fitted with large Spicer universal joints, the drive being so arranged that when the truck carries a complete load the various elements are in alignment.

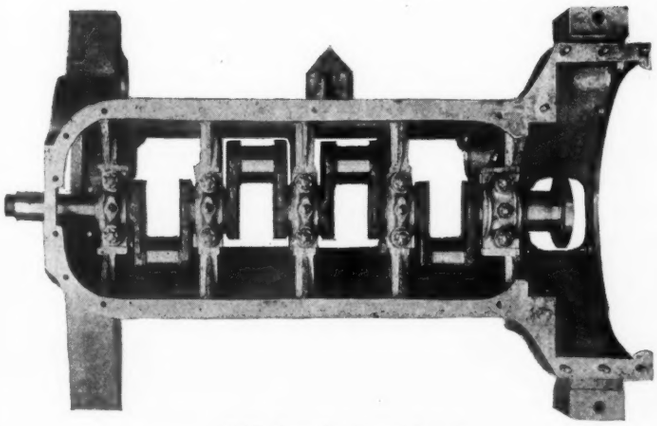
Pressed Steel Frame

The frame is built up of cold pressed steel channels, made from hot-rolled stock, these channels having a section 6 in. deep with 2½-in. flanges of ¼ in. thickness. The front axle is a drop forging of I-beam cross section, and the steering knuckles are mounted on Timken roller bearings. The rear axle is provided with the Timken-David Brown worm drive, and is completely enclosed in a reinforced pressed steel housing.

Left hand drive and center control are features of the new truck. In addition to the hand lever for throttle control, there is a foot accelerator. All control levers and pedals are of extra size and strength. The steering gear is of the worm and double nut type, which can be adjusted for wear.



Engine of the Dorris 2-ton truck



Five-bearing crankcase

Chrome vanadium steel springs are fitted, the front springs being 42 in. long by 2½ in. wide, and the rear springs 56 in. long by 3 in. wide. In the rear springs the second leaf is wrapped around the spring eye, insuring rigid construction and eliminating to a large extent all danger of spring breakage. The driving thrust and torque reaction are both taken to the rear springs, and a number of parts and their weight are thus eliminated.

Equipment

The regular equipment furnished with the Dorris model K-4 comprises an oil pressure gage, a shaft-driven speedometer, oil side and tail lamps, driver's seat with Marshall spring construction, foot-operated horn, jack and complete set of tools.

If it is desired by the customer, an electric starting and lighting equipment may be readily installed, provision being made by the Dorris company for a Westinghouse 2-unit starting and lighting system with Bendix drive, in connection with a Willard storage battery. The battery furnished is of unusually large capacity.

The weight of the chassis complete is 5200 lb., and the chassis is furnished in two lengths of wheelbase, 144 in. and 162 in. The Dorris company is concentrating on this one model, for which it believes there is a large field, as the truck is of sufficiently rugged construction to permit of carrying as much as three tons under certain favorable conditions, and it is not too heavy to make its use advantageous where only one to one and one-half tons of pay-load have to be hauled.

—

Experiments on Heat Dissipation

EXPERIMENTS have been made by the Engineering Department of the National Physical Laboratory on the effect of surface roughness on the heat transmitted from hot bodies to fluids going over them. The results of experiment for determining the heat transmission to water from the internal surfaces of brass pipes, smoothed and rough, showed that with the amount of roughening obtained the heat transmission per unit surface per degree difference of temperature between the metal and water for the smooth pipe could be increased in the ratio of about 2.5 to 1 for the same mean velocity of flow. It was obvious that if improvement of this order could be made in surfaces of air-cooled engines and radiators, considerable economy in material could be effected in aeroplane engine design. To test this out, a series of copper flanges of the form and distribution commonly adopted in air-cooled engines were fixed to a cylinder of the engine and set up in a wind channel. An electric current from a storage battery was then circulated through the flanges, and from measurements of the current and resistance it was possible to obtain the temperature of the flanges and the heat dissipated. The flanges were first tested in their ordinary smooth condition, and were then roughened by means of corrugated steel dies. In these experiments the roughening appeared to produce practically no effect on the heat transmission, this result indicating that the convection to the rough and smooth surfaces was approximately the same in each case.

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Investigation of Woods for Struts

TESTS have been made by the British Advisory Committee for Aeronautics on half-sized stream line struts, in order to compare the values of different kinds of wood for this purpose. Each strut was tested with an axial end load, and by the use of compound knife edges each end of the strut was free to take up any angle or position then under test. The modulus of elasticity for each material was found by a bending test, and this value was used to calculate the critical load to cause indefinite bending, according to the Euler theory for a simple strut. The agreement between these critical loads calculated from the dimensions of the strut and the modulus of elasticity of the material and the observed loads causing failure was remarkably good, indicating that the end constraint obtained with the special device adopted was negligible.

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Tractor Standards Urgently Needed

NOW that serious attempts are being made to specialize in the manufacture of tractor parts, there is urgent need for further standardization. We fully realize that it is impossible to work out the fundamental problems of tractor design at the conference table, but much can be done to facilitate the manufacture of tractors designed in accordance with the present state of the art.

A point in question is the width of engine supports. Manufacturers of tractor transmissions must provide a shaft for the belt pulley, with a suitable housing and outboard bearing. If there were certain standard widths of engine supports, each covering a considerable range of engine power, the manufacturer of the transmission could make the pulley shaft a given length and be tolerably certain that it would fit practicaly every tractor frame. At the present time the engine makers have no standards to work to, and the widths between supports range in a large number of steps between 18¾ and 26 in. There seems to be no reason why three sizes, say, 18, 22 and 26 in., would not serve all purposes. The former would not serve all purposes. The former would be used for the smaller and the latter for the most powerful engines, and all engines of substantially the same horsepower rating would have the same width at the supports.

It is this state of affairs that is holding back specialized development of tractor units. At present a great many tractor concerns are turning out tractors only in small numbers, and if the parts maker has to design his castings, etc., especially for each make of tractor, much of the advantage of specialized manufacture is lost.

Another subject which requires further attention is that of bell housings. These have been standardized for automobile engines, but owing to the greater strain on the housings of an unsprung machine, and especially on those housings which also form the supporting framework of the tractor, these standard housings have proved to be of inadequate strength. It is necessary for tractor purposes to use larger bolts than are provided for by the present standard, and they should be further removed from the inside edge of the flange.

The S. A. E. has made a beginning in tractor standardization, but so far little of any real consequence has been accomplished. This is no doubt due, in part, to a certain apathy of the old-line tractor manufacturers. The tractor industry, however, is entering a new stage, and a strong demand for standardization in certain lines is developing. The business of parts concerns is directly affected by standardization, and they will help the movement along in every possible way.

Farm Lighting Outfits

THE farm-lighting outfit is a natural development of the electrical equipment for automobiles. It is true that farm-lighting outfits were proposed before automobiles generally became equipped with starting and lighting systems, but most of them left much to be desired from the viewpoints of reliability and economy.

The automobile electric system constitutes really a complete electric lighting and power plant, automatic in operation, and after the problem of such a system had been fully solved it became evident that the farm-lighting-outfit problem also was capable of a satisfactory solution. Many of the details of the farm outfit, of course, would differ essentially from those of the automobile system. Weight is not an important factor, but the economy of operation must certainly be better than that of the automobile system, which in spite of being relatively inefficient does not waste much energy because very little is actually used.

The earliest farm-lighting systems consisted of slow-speed stationary gas engines, connected by belt to the generator. Automobile influence on farm-lighting outfit design may be seen in the almost universal adoption of high-speed engines for these out-

fits—not strictly high speed in an automobile sense, but certainly high speed as compared with the old-style stationary gas engine. In fact, the speed of the engine has been brought up to a point where the engine can be direct-connected to the generator without the necessity of making the latter of inordinate size.

The advantage of a direct-connected unit over a belt-driven one is apparent. Not only is the need for a belt done away with, but the amount of floor space required is greatly reduced. In fact, where a belt-driven outfit requires a whole room, the direct-connected outfit may be placed in one corner of a room.

Engines of electric farm-lighting outfits are regulated for constant speed, usually by means of a throttle governor, and the problem of voltage control therefore is quite a simple one. On the other hand, certain safeguards must be provided to protect the battery against abuse. The farmer at certain seasons of the year is very much occupied with his field work and unless the outfit is so worked out that it pretty nearly takes care of itself, it is apt to prove unsatisfactory.

What the Law Requires Is Not Enough

WHEN it comes to things which the law requires in the way of plant design and equipment, just meeting the legal requirements is, more often than not, less than what the wise and prudent manufacturer will do and not by any means all that he should do now.

What the law specifies is usually a minimum and at best it is a compromise between necessity and desirability. It is something that can be worked out in all cases and therefore not all that can be done to good advantage in most.

We are thinking now more particularly of health and safety provisions and can say, while the thought is with us, that the fact that there are such laws is, in a way, a sad commentary on our intelligence. From a more enlightened point of view they might seem like compulsory measures calculated to make us profit through the benefits which they insure. But be that as it may, the point of our present argument is that the material benefits to be derived from a liberal and intelligent provision of the things which the law prescribes fully warrant the investment and make it good business in most cases to meet the law and go it several better.

It has been repeatedly demonstrated that production is stimulated to a large extent by the very things which it has been found necessary to incorporate into law. It has been shown conclusively that the health of the worker is a matter of monetary importance to his employer. We may well quote again "Without health there is no energy, without energy there is no output," and we can add the obvious conclusion that without output there are no profits.

The newer thought is that the responsibility—and owing to the great world need for efficiency in production methods it is to-day regarded as a responsibility—of the employer is concerned not only with the conditions under which the worker works, but with the physical condition of the man himself as well.

What the law requires in health and safety provisions is not enough to-day, either from the point of view of the manufacturer or of the country as a whole.

Putting Our Colleges on War Service Basis

DURING the past year a striking metamorphosis has taken place in our college life. Even before the United States entered the war, many students left college to become ambulance drivers, and when this country became a belligerent so many volunteered for service and later were taken by the draft that some institutions were forced to close their doors for want of students and others faced an almost equally critical situation. While some of the older institutions are largely supported by endowment funds, the majority of our colleges are dependent upon tuition fees for their support, and with the decline in attendance their income dwindled away.

It is of the utmost importance to the nation that its institutions of higher education should be maintained through the period of the war, and the arrangement which has just been made, whereby the Government takes over the colleges and uses them for training men used in various capacities in connection with war work, is, therefore, to be hailed with approval.

In view of the immense amount of engineering work required at this time, much of which is of an entirely new character, intensive engineering training is quite essential, and under the new arrangement it will be given to those men in the draft who show most aptitude for such training. It is understood that the students will be picked mainly from the new class between the ages of 18 and 21, which embraces the usual range of age for entering college.

It is to be presumed that owing to the selective methods the student material will be of a better grade than normally, and the intensely practical nature of the courses to be offered should lead to results that will prove of great value to the nation.

Engineering is, of course, only one of the branches of instruction to be given during the war period. The colleges will also prepare men for infantry, artillery and machine-gunnery, naval and medical work. In fact, the Students' Army Training Corps, as the body of men enrolled in the Government's college courses will be known, will form a source of supply of skilled men from which all the various branches of our fighting and auxiliary forces can meet their requirements. As regards the class of service, the personal preference of the students are to be considered.

Latest News of the

Detroit Factories on War Work

Passenger Car Manufacturers in That District Average 75% on Munitions

DETROIT, Sept. 17—War work is steadily increasing in volume in this territory and production of passenger cars is gradually diminishing. Speaking generally all passenger car manufacturers are 75 per cent on war work. While some have entirely suspended the manufacture of passenger cars, others are still engaged to 50 per cent of their facilities on commercial production. Many, however, although working on a very decided curtailment program, have a small percentage of war work in their plants. All the larger companies are in excess of 75 per cent on war work.

The Toledo plant of the Willys-Overland, Inc., is on a 75 per cent basis, while both the Elyria and Elmira plants devote 80 per cent of their facilities to government work. From a daily production of 425 cars in June, the output of the Willys-Overland has decreased to 200 cars a day. The plant is engaged in making gun carriages and shells, and recently received an order for 3000 Liberty 8's, for which it is tooling up.

The Saxon Motor Car Co.'s plant is devoting 25 per cent of its facilities to building trucks with the resulting reduction in passenger car production of 50 per cent since June. The company has a present output of twenty-five passenger cars daily. Paige, Reo and Maxwell are on a 75 per cent, Columbia Motors 60 per cent, Dodge about 90 per cent and Harroun 50 per cent war work basis.

General Motors Corp. and Chevrolet are on a 65 to 75 per cent war basis and orders for the Government are said to aggregate $125,000,000. The Oakland Motor Car Co. is the only unit of the General Motors that has no war work. The General Motors Truck Co. is devoting almost its entire plant to war work, about 90 per cent of its facilities being engaged directly on trucks for the Government.

Willys-Overland, Inc., war orders are reported to aggregate more than $50,000,000, and those of the Maxwell Co. are equally as great.

While both the Ford and Packard plants are on 100 per cent war basis, the plants of the Dort Motor Car Co. and King are working only on commercial production at the present time, the latter company having finished its contract for Government ambulances a short time ago.

The commercial production of passenger cars of the following companies averages 25 daily: Dort, Hudson, Paige and Saxon. The King output is four and the Columbia seven. The Scripps-Booth Corp. has reduced its production 50 per cent since July; it now builds 20 cars a day.

—

Studebaker to Stop Production

SOUTH BEND, IND., Sept. 18—Special Telegram—Production of Studebaker passenger cars will stop as soon as the present stock of materials has been worked up. This announcement was made to 150 Studebaker dealers who gathered here to-day to get an outline of the company's relations in regard to them. Jan. 1, 1919, is the date set for the termination of passenger car work, from which time on the concern will concentrate on 100 per cent war work. The company is erecting some 300 homes in this city for workers to be employed in the shell plant, which also will be in operation about the first of the year. The continued rendering of Studebaker service was regarded as essential, and the furnishing of parts and replacements will be carried on as heretofore through the customary channels. The company's intentions are to give Studebaker owners the best of service.

—

Hackett Suspends Operations

JACKSON, Sept. 11—The Hackett Motor Car Co., owing to difficulties in procuring materials to maintain production, has suspended operations.

—

Jobbers Abandon Fall Convention

CHICAGO, Sept. 19—Special Telegram.—The National Association of Automobile Accessory Jobbers has called off its fall convention. This was to have been held in Medinah Temple, opening Oct. 28 and closing Nov. 2. The abandonment of the convention follows the decision not to hold the automotive equipment exhibition which was scheduled for the same building during the holding of the convention.

—

Wolfe Leaves Goodyear

AKRON, OHIO, Sept. 17—William S. Wolfe, formerly assistant chief experiment engineer of the Goodyear Tire & Rubber Co., has entered the service of the maintenance division of the Motor Transport Corps.

—

Dayton Wright Co. Builds 1000 Airplanes

DAYTON, Sept. 16—The Dayton Wright Aeroplane Co. has built its thousanrth airplane. Six thousand operatives are now employed in the plant.

New Labor Service Created

Plans Drafted for Organizing a Training and Dilution Section

WASHINGTON, Sept. 17—The Department of Labor authorizes the following:

In order to stimulate production of war supplies through the organized training of workers, to increase the competency of wage-earners and to point out ways for rendering the existing supply sufficient through dilution, the Department of Labor has drafted plans for the organization of the Training and Dilution Service.

These plans have been made after a survey of the general industrial situation. Consideration has been given existing facilities for training workmen, and a study has been made of the supply and demand for skilled workers. Incidental to the stimulation of production is the protection of wage-earners against exploitation through unnecessary dilution of labor, guarding of established trade customs and standards against needless relaxation, and, where these trade customs and standards have been relaxed, the provision of means for restoring just standards.

This service will assist all departments of the government. In addition, it will help many industries to secure more and better trained workers, when such help will benefit war production. It will also suggest improvements in training methods relating to processes, occupations and trades; will propose to factories improvements in organization that will increase output through better working conditions; will draft plans so that manufacturers may train workers, and will organize and conduct such courses of instruction. This work will be done either directly or in co-operation with the Federal Board for Vocational Education, and with state and municipal school authorities.

In order to render more effective the work of the Training and Dilution Service, a close connection is being perfected between it and the production departments of the government (Ordnance, Quartermaster's, Air Service, Navy Department and others), so as to secure prompt action when war contractors are in special difficulties which may be relieved through the training of workers. District Superintendents of Training are being appointed.

Whenever a contractor applies for help in questions of labor, this superintendent will be instructed to visit the plant. After a consideration of the conditions at that plant, and if conditions are favorable, the superintendent will organize for the employer a special training department, select competent trainers from his regular force of instructors, or suggest competent instructors from lists which the Training and Dilution Service is compiling.

Educational facilities for the instruction of employment managers have been maintained during the past few months at several universities, the first having been offered by the University of Rochester. The United States Employment Service of the Department of Labor has assisted in financing these courses in employment management; and the Director of Training and Dilution has acted with the committee in general charge of the instruction. These courses are deemed so important that both the Training and Dilution Service and the Employment Service hope to increase the number of courses now offered.

In the Dilution Service a section on "Needs and Supply" will study sources of new labor and its applicability to industries, co-oper-

(*Continued on page* 516)

Automotive Industries

Car Factory Labor Disturbed

Seek Ruling Regarding Essentiality of the Work—The Revised Regulations

WASHINGTON, Sept. 18—Following the recent draft registration many of the passenger car factory employees hastened to leave this industry for others more directly termed war work, and to prevent disaster to the industry, Hugh Chalmers, representing the manufacturers, has been in Washington this week taking up this matter.

He attempted to have the passenger car placed on the preference list, at least until the end of the year. For various reasons the War Industries Board decided against this. It was, however, explained that the preference list is no absolute guide to the District Boards, which have complete power to decide individual cases and the status of individual industries.

It was further stated that the preference list does not guide the "work or fight" order but is merely used to determine deferred classification for occupational reasons.

In other words the men entitled to deferred classification because of reasons other than occupational will not be drafted under the "work or fight" rule unless they enter under the five classes which Provost Marshal-General Crowder named last spring and which included such occupations as clerks in mercantile establishments, persons engaged in sports, etc.

As a result it is advised and will be suggested in a letter by the N. A. C. C. to the manufacturers that every manufacturer should make an affidavit to the District Board to the effect that he manufacture passenger cars, trucks or both, that he has specified war work in his plant, if this is so; and he is advised to say that it is absolutely necessary to keep certain employes for work on passenger car production until the inventories are balanced as per the agreement between the N. A. C. C. and the War Industries Board.

It is also suggested that the individual employee who is essential should make an application for deferred classification and file it with the Board together with affidavit of his company and a copy of the agreement of August 24 between the N. A. C. C. and the War Industries Board.

It is believed that since the manufacturers must be allowed to continue, to fabricate the materials on hand and complete production or suffer great financial injury, that the District Boards will heed the pleas. These Boards are governed largely by the decisions of an Advisory Board which investigates the merits of the different industrial exemption claims and which are comprised of a member nominated by the Department of Labor, one by the Department of Agriculture and one by the District Board.

Following is an extract from the revised selective service regulations which explains in detail the consideration given the preference lists issued by the War Industries Board and the methods of determining industrial exemption:

District boards are charged with the duty of selecting the individuals whose engagement in industry, including agriculture, or whose occupations or employments are such as to require their continued service in civil life rather than in the army.

In order to provide for the necessary adjustments between the necessities of the military establishment and the requirements of the industries, occupations, and employments, including agriculture, found to be necessary to the maintenance of the military establishment, the effective operation of the military forces, and the maintenance of the national interest during the emergency, there shall be appointed by each district board three persons to be known as industrial advisers to the district board.

One such person for each district board shall be nominated by the Department of Labor, one by the Department of Agriculture, and one by each district board, who shall thereupon be appointed by the respective district boards.

Whenever, in the discretion of the President, more than three such industrial advisers are required by a district board, the President may call upon the Department of Labor, or the Department of Agriculture, or the district board to nominate such additional industrial advisers, who shall thereupon be appointed by such district board.

Such industrial advisers so appointed by each district board shall not in any sense be members of such district board, shall have no right to vote at any meetings thereof, and shall have and exercise only the rights, duties, powers, and functions herein specifically given.

Such advisers shall have the right to furnish all pertinent information to the district board and may attend meetings of the board upon request of the board to which they are attached.

Such advisers may place before the district board at its meetings, or at such other time as the board may request, all facts and information in their possession as to the preference lists issued by the Priorities Division of the War Industries Board. Such lists shall not be regarded as binding upon the district board in its conclusions as to whether or not any particular industry, occupation, or employment, including agriculture, is a necessary industry, occupation, or employment within the meaning of the law and regulations, nor shall such lists prevent the district board from holding as necessary any industry, occupation or employment, including agriculture, not contained therein. Such preference lists and other facts and information in the possession of such advisers will supplement the information in the possession of the district boards and will also be used to assist the district boards in dealing with specific cases.

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Investigate Tin Stocks

WASHINGTON, Sept. 18—The War Trade Board has requested concerns in this country to make statements of the tin plate held in stock for exportation to foreign buyers or for sale to exporters who have orders from foreign buyers.

Senate Favors Air Department

Recommends Passage of Bill Creating Secretary of Aeronautics—Amendments

WASHINGTON, Sept. 18—The Senate bill to create an executive Government department to be known as the Department of Aeronautics and for the appointment of a Secretary of Aeronautics was reported favorably to the Senate by the Committee on Military Affairs yesterday. Several amendments were filed and it was recommended that the Senate pass the bill.

Following is the original bill and the report containing the amendments and recommendation:

Text of the Bill

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that there is hereby created for the period of the present war and for one year thereafter an executive department in the Government of the United States to be known as the Department of Aeronautics, the head of which shall be designated the Secretary of Aeronautics, who shall be appointed by the President and confirmed by the Senate. He shall be a member of the Cabinet and shall receive a salary of $12,000 a year. The Secretary of Aeronautics shall have direct and complete control of all matters pertaining to the designing, purchase, manufacture, and production of aircraft and aircraft equipment intended for use of the Army, the Navy and the Marine Corps of the United States.

That the department shall also have an Assistant Secretary, who shall be appointed by the President and confirmed by the Senate, who shall receive a salary of $5,000 a year; and such other officers and employees as may be found necessary for the proper and efficient transaction of the business of the department.

That the unexpended balance of such appropriations as may have hitherto been made for the purchase and manufacture of aircraft and aircraft equipment and all appropriations which may hereafter be made for such purpose shall be available for the purposes of the department.

REPORT

The Committee on Military Affairs, to whom was referred the bill (S. 4852) to create an executive department in the government to be known as the department of aeronautics, and for the appointment of a secretary of aeronautics and an assistant secretary, and providing for appropriations for said department, having had the same under consideration, report it back to the Senate with the recommendation that it pass with the following amendments:

On page 1, line 9, strike out the words "shall be a member of the Cabinet," and

(*Continued on page* 516)

New York Approves Anti-Glare Devices

Bulbs of Prescribed Candlepower Must Be Used to Comply with State Law

ALBANY, N. Y., Sept. 16—Secretary of State Francis M. Hugo has made public the names of 45 anti-glare devices which have been tested according to the provisions of the New York headlamp law and which are approved for use in New York State. However, it is essential, in order to comply with the requirements of the law, that they be used with headlamp bulbs of prescribed candlepower, and, in some cases, that headlamps be properly tilted. In the case of 20 devices, lamps need not be tilted.

The law under which these tests were made undoubtedly represents the first attempt of any state legislature to attack the headlamp glare problem in a scientific manner. Prior to the drawing of the law, the Secretary of State's office consulted with representatives of the Society of Automotive Engineers and the Society of Illuminating Engineers in an effort to obtain some basis upon which to determine the nature of glare and the best remedial measures. In consequence, a measure was drawn which prescribed that:

1—The candlepower of headlamps must be at least 1200 at a distance of 200 ft. in front of the car and at a point between the roadway and 42 in. above it.

2—The candlepower must not exceed 2400 at a distance of 100 ft. in front of the car and at a point 60 in. (or any higher) above the road.

3—The candlepower must not exceed 800 at a distance of 100 ft. in front of and 7 ft. to the center of the car at a point 60 in. above the road.

The devices which have been approved have been determined by tests to come within the requirements of the law when used with bulbs of a prescribed candlepower. In using these devices, Secretary Hugo suggests that dealers and owners:

1—See that the right candlepower bulb is used.

2—See that lenses are properly placed and not twisted: that the top side is at the top and that the front is outward.

3—See that the tilt is correct. To do this have the car on a level surface in front of a wall or some suitable vertical surface, 30 ft. or more distant. Remove the front glasses or devices and by means of focusing adjustments move the bulb back and forward until the beam of the smallest diameter is obtained on the wall. By measuring the height of the center of the beam from the ground and comparing that with the height of the center of the headlamps from the ground, the tilt can be ascertained and adjusted as required.

4—See that the bulb is properly adjusted with respect to the focus of the reflector with the controlling device in place. Do this by observing the beam pattern on the wall.

Herewith is the list of approved devices.

The term "B Lamp" in the accompanying table refers to the usual Tungsten headlamp bulb. The term "C Lamp" refers to the gas-filled headlamp bulb.

—

Urge Higher "Gas" Price for Canada

OTTAWA, Sept. 10—That an order-in-council fixing the retail price of gasoline in Ontario and the West is advisable, is a statement made in a report by R. J. McFall, High Cost of Living Commissioner, to Hon. T. W. Crothers, Minister of Labor, on the cost of gasoline, made public to-day. McFall suggests a ruling which would establish 36 cents as a maximum retail price in Ontario, 43 cents in Saskatchewan and 45 cents in Alberta. No changes are suggested in the wholesale price of gasoline, it being noted that the cost of imported gasoline has increased from 5/6 of a cent to 1½ cents a gallon because of increased freight rates and other causes.

—

Mason Rubber Co. Gets War Order

KENT, OHIO, Sept. 14—The Mason Rubber Co. has been awarded a Government order for $100,000 worth of gas masks and raincoats and it is anticipated that further war orders will be received.

Gasoline Shortage in Argentina

75 Per Cent of Automotive Vehicles Laid Up in Storage Owing to Lack of Fuel

BUENOS AIRES, Aug. 15—There is practically a complete stoppage of the use of automobiles in Argentina, due to shortage of gasoline. Not only is gasoline selling at an exorbitant price but the actual lack of it is so great that conservative estimates say that 75 per cent of the automobiles are laid up and in storage in consequence.

This situation is acting very much to the detriment of the sale of American motor trucks, tires, accessories, automobiles and motorcycles. This is the winter season and bad roads always stop a percentage of cars from being used while the rainy season is on, but this year the situation is more acute than ever before in the history of the American automobile in Argentina.

Large distributers of American acces-

Automobile Lenses and Devices Approved by New York State

Devices	Beam Horizontal—B Lamp.	Beam Horizontal—C Lamp.	Beam Tilted—B Lamp.	Beam Tilted—C Lamp.	Tilt, Ft. per 100 Feet.
Bausch & Lomb	..	..	17	15	3
Conaphore, clear	17	13	24	20	1
Conaphore, noviol	17	13	24	20	1
Controllite	18	20	..	..	.
Clamert	18	15	..	..	.
Culver, radio	17	17	20	20	1
Coreylite	24	24	..	..	.
Crew-Levick, Fractor	20	11	24	20	1
Dillon	10	..	..	..	.
Dwellelight	10	..	..	..	.
Enlow, prism dimmer	16	14	22	20	3
Hein, dimmer	24	24	..	..	.
Holophane	18	16	22	20	1
Legal level light	..	..	17	20	2
Lee Knight lens	11	13	18	24	1½–2*
Lenslite	18	16	22	20	1
Liberty	17	2[illegible]	..	..	.
Letts	..	..	24	24	2¾
Legalite	..	..	17	20	3
Mac-Kno-Glare, bulbs	20	..	..	..	1
Mac-Kno-Glare, caps	..	..	20	21	1¾
McKee	11	15	17	21	1
More-Lite, clear	10	..	..	..	.
Macbeth	21	24	..	..	.
Nu-Ray	11	10	17	15	1
No-Glare-On, bulb	10	..	..	..	.
Non-Glare, lens	..	..	17	20	4
Non-Glare, shade	24	24	..	..	.
Osgood	15	15	20	20	1
Ormiston	24	24	..	..	.
Prismolite	13	12	20	20	2
Primolite	19	25	..	..	.
Raydex	..	..	22	20	1½
Right	11	13	19	21	3
Sun-Ray	10	14	17	20	1
Saferlite, diffusing	10	..	..	..	.
Saferlite, deflector	..	..	17	20	3
Stryker, deflector	17	..	24	..	¾
Shaler, roadlighter	21	24	..	..	.
Stop-Glare lens	10	..	..	..	.
Stewart	12	..	..	..	.
Suess rib lens	..	..	17	14	3
Victoria, non-glare bulb	18	10	..	..	.
Warner	10	..	..	..	.
Webb Multifrax	..	..	17	17	3

*Manufacturer's adjustment.

sories, tires, etc., in Argentina declare that unless the present acute situation is alleviated promptly the results will be very damaging to the future of the American motor car and its accessories so far as their sale in Argentina is concerned.

The world war has given American commerce its first opportunity to obtain on a large scale a foothold in the Argentine market, and it behooves America to remove any obstacle that may prevent that foothold from gaining a solid foundation that will not give way under the powerful competition that is bound to come when the war is over.

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Consumption of Gasoline Exceeds Production

WASHINGTON, D. C., Sept. 14—We are at present using 3000 bbls. of gasoline daily more than we are producing, according to Fuel Administrator Garfield, who has presented statistics to the Senate following the resolution introduced by Senator Lodge.

The figures, which were compiled by the Oil Division of the Bureau of Statistics, indicate a reserve supply for about 30 days. Mr. Garfield attributes the constantly diminishing stocks on hand to the heavy war demand.

Since April 1, when production was highest, there has been a decrease in reserves of 4,119,000 bbls. of oil. Since April there has been a daily deficit of 6000 bbls., which would indicate a deficit for the year of approximately 2,000,000 bbls. It is stated that stocks of crude oil are constantly declining and kerosene and fuel oil supplies are unsatisfactory, all of which bears an intimate relation to the gasoline problem. Following are the statistics covering stocks of gasoline in the East:

EAST OF CALIFORNIA

	Barrels.
Gasoline and naphtha stocks, 1918—	
Jan. 1	8,400,000
April 1 (high point)	11,000,000
Aug. 1	7,800,000
Decline in stocks	3,200,000

Estimated daily production and consumption:

	Barrels.
Approximate daily consumption—	
Domestic	160,000
Export	34,000
Total daily consumption	194,000
Approximate daily production	191,000
Average daily deficit	3,000

(Probable result for year ending Dec. 31, 1918.)

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Wisconsin Branch of N. A. D. A. Formed

MILWAUKEE, Sept. 14—A Wisconsin branch of the National Automobile Dealers' Association was organized on a temporary basis at a meeting of State dealers which followed a luncheon tendered by the Milwaukee Automobile Dealers' Association at the Milwaukee Athletic Club on Sept. 11. Another meeting will be held in about a month, at which a permanent organization will be effected. Officers will be elected at that time. In the meantime, an organization committee consisting of one representative dealer from each of the twenty-one counties in Wisconsin will do local promotion work and conduct a membership campaign.

A Balloon Target for Aviators

Released in the Air and Used Like a Punching Bag by the Flier

WASHINGTON, Sept. 16—A target resembling a cylindrical shaped balloon has been devised as a float target for airplane gunners. It is released in the air and is said to be to the airplane quite like the punching bag is to the boxer.

The new target is taken aloft by a cable attached to an airplane through the bottom of the fuselage and wound on a windlass. At 5000 feet it is released and allowed to float free. The airplane dives at the target, runs from it and uses every stunt, the barrel roll, the Immelmann turn, the side slip, nose dive and tail spin, while shooting at it. The target is at the mercy of the air currents and, being light in weight, twists and turns in every direction and manner, making it as tricky as a Boche opponent. Service ammunition is used by the gunner. This target practise is engaged in over uninhabited areas.

This form of target was devised by the instructors of the gunnery school at Rockwell Field, California, which is under the Division of Military Aeronautics.

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Automobile Trade in Shanghai, China

By R. W. Davis

SHANGHAI, CHINA, July 31—There are probably about 2000 automobiles of various kinds in Shanghai, all of which are used for utilitarian purposes. This is a goodly number when you think that the farthest point you can reach from Shanghai with an automobile is 8 miles from the center of the town. This road condition applies to nearly all cities in China, and consequently the use of the automobile is restricted to the conveyance of owners from the residential portions of Shanghai to their offices, an average distance of 2 to 3 miles. As China is very little affected by the war, any influence on the automobile industry that might be attributed to the war must be ignored, so far as conditions here are concerned. Native labor is so cheap that it is doubtful whether motor trucks or farm tractors could compete with it either in road transportation or agricultural work. There are a few motor trucks in Shanghai used for such purposes as electric cable repairing, fire department work, etc.

One of the greatest drawbacks in connection with American makers of automobiles for the Chinese field is their failure to provide handbooks or manuals giving every detail relating to the car and its operation. There are very few motor experts in China who have time to give instructions to buyers, the consequence being that the standard of driving and caring for an automobile is very low. I would estimate that 75 per cent of the cars are driven by Chinese chauffeurs who are entirely ignorant of such niceties as proper breaking, gear-shifting, etc. The American automobile manufacturer who takes the trouble to have a book of instructions translated into Chinese for the use of chauffeurs would enjoy considerable advantage over others, apart from the direct advertising value which would come from such.

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Federal Rubber Co. Makes 1000 Gas Masks a Day

MILWAUKEE, Sept. 16—The Federal Rubber Co. has reached a production of more than 1000 gas masks a day. Between 100 and 125 women are engaged in this department of the work and as soon as more help becomes available the number will be increasd to at least 400. Throughout other departments of the plant, more than 300 women are now employed, they having taken the places of men who have entered the service. Another notable development of the war is that the Federal plant now employs twenty-five deaf mutes in the woodworking shop and rubber departments.

—

Safety Congress Meets at St. Louis

ST. LOUIS, Sept. 16—The seventh annual safety congress of the National Safety Council opened at the Hotel Statler to-day. The Automotive Section meets Friday. The program follows:

1—Report of Chairman.
2—Report of Secretary.
3—Reports of Committees.
4—Addresses:

Machine Shop Layouts and Their Relation to Safety, by C. A. Briggs, Safety Engineer, Willys-Overland Co.

Safety in Punch Press Operation, by W. W. Roach, Safety Department, Dodge Brothers.

Necessity of Inspection for Overloaded Floors, by D. R. Livingston, Supt. Safety Division Reo Motor Co.

Selling Safety to Employees. J. J. Lynch, Chevrolet Motor Co.

Gasoline in the Industries, When Used as a Solvent, by R. A. Shaw, Safety Department, Ford Motor Co.

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Women Operating Farm Tractors in England

LONDON, Sept. 2—Women are proving very satisfactory and are rapidly replacing men in the operation of farm tractors in England. An official statement recently issued by the Food Production Department says that women are doing excellent work. It also reports that the Government has supplied on hire to farmers 4100 tractors and has arranged for the direct sale to farmers of more than 2000 more machines.

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Kenly on Army-Navy Board

WASHINGTON, Sept. 14—Major General William L. Kenly, director of military aeronautics, has been detailed by the President as a member of the Joint Army and Navy Board of Aeronautic Cognizance, vice Major General George O. Squier, chief signal officer, relieved.

Reopen Air Service for Induction

Both Mechanics and Officers Needed as Pilots, Armorers, Observers and Balloonists

WASHINGTON, Sept. 18 — The Air Service has been reopened for induction of mechanics and of candidates seeking commissions as pilots, armorers, observers and balloonists, irrespective of status in the draft. Candidates are sought for this service, which has been closed for the past 6 months, because of its rapid and huge growth.

Twenty-nine flying fields have been completed in this country. More than 1200 deHaviland planes, 6000 Liberty engines, parts for the first heavy night bombers, 6600 training planes and 12,500 training engines have been completed and necessitate the increase of both the commissioned and enlisted personnel in order to maintain full strength in this country and continue the necessary flow overseas. There is fast movement overseas of air squadrons, planes, engines and material for American aerodromes, fields and assembly plants in France and England, according to a statement issued here to-day by the War Department.

The Air Service is to-day 160 times what it was at the outbreak of the war. On April 6, 1917, it numbered 1100 enlisted men regardless of cadets in training and officers as compared to 147,434 enlisted men on Aug. 1, 1918. Civilians have not been allowed to qualify as pilots since March, 1918. During last fall and the early winter 6600 prospective flyers, accepted by the examining boards, had been built up and has since been gradually drawn upon as the Service grew. In addition many of the enlisted men have bee nallowed to train for commissions.

Applicants may apply at the Aviation Examining Boards. The age limits for flyers are 18 to 30 years, inclusive, with preference to those under 25, and for balloonists from 18 to 45. The examining baords are located at:

Atlanta	Georgia School of Technology
Boston	739 Boylston St.
Chicago	230 East Ohio St.
Dallas	Camp Dick
Fort Sill, Okla	Post Field
Los Angeles	Marsh-Strong Bldg.
Minneapolis	University of Minnesota
New York	104 Broad St.
San Antonio	Fort Sam Houston
San Francisco	55 New Montgomery St.
St. Louis	525 South Eucalid Ave.
Washington	Bldg. D, Floor 1, Wing 2
Canal Zone	Camp Sherman

The call for mechanics opens the Service to men anxious not only for active field work but also for the service for which their training best fits them. Skilled men only are wanted. Those accepted will be sent to a Concentration Depot, trade tested, given special intensive training in airplane mechanics and then organized into airplane crews and squadrons, some for duty here, others for duty overseas, with good opportunity for advancement, since four-fifths of the men are promoted above the grade of private.

Believe Electric Tax Unfair

WASHINGTON, Sept. 18 — Electric truck manufacturers have filed a letter with the Ways and Means Committee asking for reconsideration of the proposed tax of $5 per horsepower and 50 cents per 100 lb. weight. The manufacturers believe that this rate is too high. One objection has been that it is considerably higher than gasoline-driven trucks, on which the tax ranges from $10 for 23 hp., $20 on 30 hp., $30 on 40 hp. to $50 over 40 hp. Congressmen have answered this by saying that when the 2 cents per gal. tax is included, the gasoline-driven trucks pay an even higher tax than the electric trucks. This works out, for example, with a 5-ton 6-hp. electric truck weighing 5000 lb. paying a tax of $30 on horsepower and $25 o nweight, or a total of $55, as compared with a 5-ton gasoline truck of 40 hp. paying $30 tax and consuming, say 10 gal. of gasoline a day, a daily tax of 20 cents, or $60 a year. The electric makers do not believe this comparison is a just one. They state that there is a discrimination against electric trucks.

Liberty Tractor Co. Organizes

The Liberty Tractor Corp., Detroit, has been organized with a capitalization of $100,000. The incorporators are: Frank H. Farnham, John O'Donnell and Ignatius Mirkovich.

Senate Favors Air Department

(*Continued from page* 513)

On page 1, line 12, strike out the word "and," and after the word "production" insert "and operation."

On page 2 add as a new section to the bill the following:

"Sec. 4. The President is hereby authorized to establish the necessary subordinate bureaus for the conduct of the operation of the department of aeronautics and to transfer to said department such functions, powers, and duties now vested by law in other departments of the government pertaining to the air service and such personnel necessary for its operation."

New Labor Service Created

(*Continued from page* 512)

ating especially in this work with the Woman in Industry Service and other policy bureaus of the Labor Department, so as to maintain the unity of the government's labor policy.

Advice from the Working Conditions Service, of the Department of Labor, will be sought regarding industrial standards. At the same time the facilities of the Employment Service and of its Women's Division will be utilized in obtaining information as to the needs and the supply of labor. In return, the Training and Dilution Service will be able to assist the Employment Service in meeting the demand for skilled workers, which make up about 70 per cent of the labor calls of employers.

A section on "Industrial Hygiene," of the Training and Dilution Service, will be established to inquire into the conditions and suitability of particular factories for dilution.

Among the more difficult problems now confronting the Training and Dilution Service is the "following-up" of workers who have received training in order to assure proper surroundings for health, morals and efficient utilization of their ability. Another problem is that of the wastage of manpower. The Training and Dilution Service will study such problems as these with a view to pointing out methods that will minimize waste in industry due to overmanning.

Mexican Mines Need Many Trucks

Admitted Duty Free at Present —Required to Replace Railroads Destroyed

MONTEREY, MEX., Sept. 9—Several of the larger mining companies of Mexico have placed orders for motor trucks recently. Shipments of trucks are beginning to arrive in Mexico for these concerns as well as for use of manufacturing plants in the City of Mexico. The irregularity of railroad traffic is necessitating the substitution of motor truck hauling wherever possible. In discussing the subject of Mexico as a market for motor trucks H. M. Gillespie, sales manager of the Southern Motor Co. of El Paso, who is familiar with conditions in this country, said:

"There is a great future for the truck industry in Mexico as soon as trade is again opened up with the United States under former international conditions of trade. Now that mining is picking up again, there is a greater demand for trucks than before the Mexican revolution, because many miles of railroad have been destroyed as well as thousands of cars. It is impossible for mine operators to get the ore to the smelters by rail as formerly and they must do it quickly. They have no time to wait until a railroad is rebuilt.

"Therefore trucks are in demand. At present trucks are admitted to Mexico free of duty, which greatly encourages the business. With a return to the old relations with our Mexican neighbors, as well as further settlement of internal conditions in Mexico, the truck trade in Mexico will quickly assume gigantic proportions."

Curtailment of Non-War Industries

WASHINGTON, Sept. 12—The War Industries Board has arranged for the cooperation of the various State Councils of Defense in the matter of curtailing various non-war industries. The State Councils will make investigations and recommendations, and while these recommendations will not be final, they will play an important part in the decisions rendered by the board. The State Councils will investigate and report general non-war construction, but they will not enter into the undertakings of the War Department, Navy Department, Emergency Fleet Corp., Bureau of Industrial Housing and Transportation, United States Housing Corp. or the following civilian enterprises:

Repairs of or extensions to existing buildings involving an aggregate cost not exceeding $2,500.

Roadways, buildings and other structures undertaken by the United States Railroad Administration.

Mines producing coal, metals and ferroalloy minerals.

Public highway improvements and street pavements which have been approved by the United States Highways Council.

Building projects not mentioned above will require special written permits from the Priorities Division of the War Industries Board. Any one contemplating a building which he believes to be in the public interest, or otherwise essential under the existing emergency conditions, should make a full statement of the facts in writing under oath, and present it to the Local Council of Defense, which will in turn take it up with the War Industries Board.

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Store Door Delivery for Philadelphia

PHILADELPHIA, Sept. 12—Covering delivery in this city of less than carload freight lots, the railroads, according to federal plan, in co-operation with the Chamber of Commerce, are putting into effect a "store door" delivery system. Consignees will have only 24 hr. in which to remove freight after it arrives. Failing in this, the freight will be loaded on motor trucks and delivered to the consignee at his expense for the hauling.

The Pennsylvania Railroad, under a new plan, whereby the city is divided into 14 shipping zones, will take all shipments consigned to the western destinations, as Harrisburg and beyond; the Reading, to the north and northwest, and the Baltimore & Ohio, to the south.

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Hupp Surplus $1,176,262.50

DETROIT, Sept. 14—Net profits of the Hupp Motor Car Corp. for the fiscal year ending June 30 were $836,691.30. Surplus fund was $1,176,262.50 compared with $431,124.30 for the same period last year. Total assets were $8,939,789.91. Current assets showed cash on hand of $731,165.70; accounts receivable less all doubtful accounts, $762,877.94; bills receivable, $12,764.35. Inventories based on cost totaled $1,834,786.09, with securities, including Liberty bonds, aggregating $173,860.36. The company had no outstanding bills payable. Accounts not due totaled $749,645.52, tax reserve, $279,971.28, and reserve customer deposits were $215,910.61. A copy of the balance sheet follows:

Truck Builders Get Preferential List

War Industries Board Lists Approximately 70 Industries and Over 6,000 Plants

WASHINGTON, Sept. 14—The National Automobile Chamber of Commerce has written to motor truck manufacturers announcing that the War Industries Board has issued a preferential list of industries which will be sent to them in a few days. The letter, which indicates the basis to be adopted for the classification of essential uses of trucks and the matter of deferred classification under the draft law, follows:

To Motor Truck Manufacturers:

1. The War Industries Board has issued a preference list of industries. This list includes approximately 70 industries and more than 6000 individual plants which are being added to from time to time.
2. A list of these industries will be sent you within a few days, and the list of 6000 individual plants can be seen in the custody of the local draft board or the representative of the U. S. Labor Bureau in your city.
3. The final revised list of industries, which is to be a guide for truck sales, we hope to forward within a few days.
4. Among the individual plants are or will be listed the approved manufacturers of motor trucks who have filed pledges and applications for places on the preference list. Necessary employees of such companies will be considered in essential work.
5. Manufacturers of passenger cars are being handled in another manner by the War Industries Board. They are being given certain priority for materials to match up their stocks of materials on hand under a curtailment program.
6. This list of industries and the 6000 individual plants will be the guide for essential uses for trucks, as agreed with the War Industries Board. This list may be used as a basis, but where any question arises as to the essential use of a truck, the matter should be referred for definite ruling to the Automotive Products Section of the War Industries Board, for submission to the Priorities Division.
7. This new preference list will not bind the district draft boards in allowing deferred classification under the draft law. Persons seeking deferred classification, whether they are employers or employees, will submit to the draft board whether they are so essential to industry that they should remain out of military service. The draft boards will determine what industries are necessary and what employees are necessary to the maintenance of such industries.
8. The real purpose of the master key preferential list of industries is not to operate as an embargo against other industries not named, but "to defer the requirements of all other industries and plants until those on the preferential list shall have been satisfied."
9. Industries have been grouped into four classes. The classes differ in degree of necessity as vital elements in the prosecution of the war.

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Skilled Workers Still Critically Short

WASHINGTON, Sept. 14—Transfers of machinists and other skilled workmen from non-war work to war production through the United States Employment Service is increasing steadily, according to a statement made by the Department of Labor. The Employment Service has sent a number of examiners throughout the country to recruit skilled workers at non-war plants by patriotic appeals. The examiners comprise machinists, boiler makers and sheet metal workers.

The shortage of skilled labor in the war industry is considered critical. It is said that even if the non-war industries give up their entire organizations of skilled workers it is doubtful if the supply will meet the demand. It is estimated that not more than 25 per cent of the machinists in the country are still engaged in non-war work, and that some of these are unable to move to war industries centers because of family and other primary considerations.

The following skilled workers are most sorely needed in the order named: Machinists, boiler makers, riveters, chippers, calkers, molders, structural iron workers and coppersmiths.

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Glenn L. Martin Tests First Plane

CLEVELAND, Sept. 14—The first plane produced by the Glenn L. Martin Co. has been completed and has flown from Cleveland to Dayton for experimental tests with a crew of four men.

ASSETS

Plant Assets:			
Land		$98,656.62	
Buildings		866,242.41	
Machinery		407,096.69	
Factory equipment		414,995.53	
Special tools, jigs, and patterns for current Models "Net"		170,868.55	
Furniture and fixtures		54,210.69	
		$2,012,070.49	
Less reserve for depreciation		435,647.70	
Total property investment			$1,576,422.79
Note: The land, buildings, machinery and equipment were appraised by the American Appraisal Co. as of Dec. 31, 1916, as having a sound value of $762,740.09 more than the value as shown on the books.			
Current Assets:			
Cash		$731,165.70	
Accounts Receivable:			
For cars protected by B/L drafts	$476,221.89		
For parts protected by B/L drafts and customers' deposits	180,089.21		
Sundry debtors	106,566.84		
	$762,877.94		
Less reserve for doubtful accounts	27,590.89	735,287.05	
Bills receivable		12,764.35	
Inventories at cost:			
Raw and worked material and supplies	1,516,619.14		
Work in process	260,345.85		
Finished cars	57,821.10		
		1,834,786.09	
Investments in securities:			
Preferred stock purchased for retirement (in Treasury)	$99,710.36		
Investment in stock, Detroit Shell Co.	50,000.00		
Investment in sundry securities	400.00		
Investment in Liberty Loan Bonds	23,750.00		
		173,860.36	
			3,487,863.55
Deferred charges, prepaid insurance and taxes			16,582.64
Goodwill, trade names, etc.			3,858,920.93
			$8,939,789.91

LIABILITIES

Capital Stock Issued:			
Preferred stock		$1,307,900.00	
Common stock		5,192,100.00	
			$6,500,000.00
Surplus:			
Surplus, June 30, 1917		$431,124.20	
Net profits, June 30, 1917 to June 30, 1918	$836,691.30		
Preferred dividends paid June 30, 1917, to June 30, 1918	91,553.00		
Transferred to surplus		745,138.30	
Surplus, June 30, 1918			$1,176,262.50
Current Liabilities:			
Bills payable			None
Current accounts payable (not due)			749,645.52
Reserve for accrued taxes and interest			297,971.28
Reserve for customers' deposits and redemption of service coupons			215,910.61
			$8,939,789.91

Highway Labor Problems Under Jurisdiction of Chapin

WASHINGTON, Sept. 14 — All labor problems coming under the United States Employment Service and which are in connection with highway utilization will be referred to the Highways Transport Committee of the Council of National Defense, which is headed by R. D. Chapin, chairman.

The committee will adjust all problems of labor as connected with transport activity, either power or horse drawn. This new additional work for the Highways Transport Committee is the result of a letter received from J. B. Densmore, Director General of the United States Employment Service, as follows:

The U. S. Employment Service recognizes the war-time need for making the most effective and efficient utilization of our highways as a means of strengthening and increasing our transportation resources, and especially is acquainted with the valuable direction given by the Highways Transport Committees to this problem.

We are also convinced that tonnage capacity of our highways transport resources can be greatly increased by applying all possible vehicles, horses and labor in line with national policies promulgated by you and, naturally, in transportation that vitally aids in accomplishing our war program.

We therefore desire to effect any adjustment of labor employed in any phase of highways transport activity, relating to either power or horse-drawn vehicles, in co-operation with your national organization, relying on your State Highways Transport Committees to furnish the facts regarding essential highways transport activity with which they are intimately familiar and on which our state and local labor department officers may base their necessary orders.

We are therefore transmitting instructions to our representatives, advising them that all matters touching or in any way affecting highways transport operations are to be dealt with on the advice of your organization.

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Seven Aviation Deaths

WASHINGTON, Sept. 14 — Seven deaths resulted from aviation accidents in training at flying fields in this country for the week ended Sept. 7, 1918. This number represents one fatality for every 1469 hr. flown, or 117,520 miles of air travel. Following is the summary:

Barron Field, Everman, Texas	2
Kelly Field, San Antonio	2
Mather Field, Sacramento	2
Taliaferro Field, Fort Worth	1
Total	7

—

Reo Prepares for Apprentice Course

LANSING, Sept. 14—The Reo Motor Car Co. is making preparations for the establishment of an apprenticeship course which will be opened early in October. John H. Amiss, for 7 years superintendent of the Lima Consolidated Schools, Howe, Ind., has been engaged as educational director. Shop mathematics, layout work, blueprint and mechanical drawing will be some of the studies taught in the class room. The course, as now mapped out, will require 3 years to finish, the apprentice receiving at the end of this time a certificate which vouches for his skill as a mechanic. The age limit of the applicant has been set at from 16 to 19 years. The apprentice course is not confined to boys whose fathers may be Reo employees, but covers all applicants and is not as exclusive as the old course. Machines for instruction are being installed as well as benches and other equipment for the students' use. There are now fifteen applications filed for entrance, and when the school is in full swing the company will have at least 200 apprentices enlisted in the course.

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Girls in Cadillac Service Department

BOSTON, Sept. 14—Young women have been added to the mechanical department of the Cadillac Automobile Co. by Manager Albion L. Danforth. After giving the matter some thought, having put girls to work in the salesrooms where they proved efficient, he decided to try them in the service department. The first girl was put to work in the stock room supplying parts to customers. She did the work so well that the vacancy in service sales department caused by the draft was filled with another young woman. She proved very valuable and fitted into the position nicely, where she determines cash and credit transactions from her credit file at the time a job order is written, and keeps a record of all the movements of cars through the various departments of the building as well as answering numerous telephone calls. And the customers seem to like dealing with the young women, who are courteous and intelligent. Others will fill places made vacant from time to time.

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Massachusetts Pumps 100% Perfect

BOSTON, Sept. 14—The Massachusetts State Department of Standards has just finished an investigation of the gasoline pumps throughout the state to determine if motorists were receiving full measure these days. This is the second year an investigation was held, last year many pumps being found defective. By means of cars in which specially constructed glass tanks were placed, with measurements carefully marked, it was possible to drive up to any roadside pump, buy gasoline and in a minute determine whether it was perfect or imperfect. The department permits a variation of 6 cu. in., or about 5 tablespoons, in 5 gal.

This year Thure Hanson, director of standards, has announced that there has been a marked improvement, and that it may be said that the pumps in Massachusetts are practically 100 per cent perfect.

—

Overland Gets Curtiss Engine Contract

WASHINGTON, Sept. 12—The Willys-Overland Co. has received a contract for 1500 Curtiss O. X.-5 airplane engines of the 8-cylinder type, to be used in training planes.

Liberty-Engined Caproni Makes Climbing Record

NEW YORK CITY, Sept. 14 — The Caproni bombing plane, fitted with three navy type, low-compression Liberty engines, has been getting tuned up for its official Government test, and this week has established some new climbing records for a bombing plane of this type, which has a capacity for carrying approximately 4000 lb. of bomb load. In its climbing test on Sept. 9 the Caproni climbed 3000 meters, or over 9000 ft., in 16 min. with a full load of gasoline and four men. This is a better climbing performance than this plane has ever made before, and is a new record for climbing with planes of this capacity.

—

More Trucks in Massachusetts

BOSTON, Sept. 14—Taking Massachusetts registrations for Jan. 1 to Sept. 1 this year, and comparing them with the figures for the total of 1917, they show that of the increased machines registered this year for every passenger car listed there were registered 1 3/5 trucks, or 16 trucks for every 10 cars.

Last year there were registered in Massachusetts 148,266 cars. Up to Sept. 1 this year there were 151,818 cars listed, or 3552 more than the entire 1917 figures. For the 12 months of 1917 there were 26,008 commercial vehicles listed, and for the first 8 months of this year there were 31,649 registered, or a gain of 5641. That is 2089 more commercial vehicles than passenger cars.

If a comparison is made between the first 8 months of 1917 and the same period of this year the figures are 136,417 and 151,818 cars respectively and 24,025 and 31,649 trucks. That was 15,401 cars gained and 7624 trucks. However, if it were not for the big truck gain this year, representing some 32 per cent to 11 per cent for cars, the total registration for 1918 up to date would have fallen below the figures for the entire year of 1917.

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Road Oil for Army Camps

WASHINGTON, Sept. 12—The Fuel and Forage Division of the Quartermaster Corps will purchase 903,000 gal. of road oil for the Construction Division, for use at fifteen camps and cantonments in this country. This road oil is to be used to lay the dust around camp hospitals and upon drill grounds. About 10,000 tank cars will be required to deliver this quantity.

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Housing and Transportation

WASHINGTON, Sept. 14—Housing and transportation conditions have become so congested in some cities where war supplies are being manufactured that the General Staff has cautioned the purchasing agencies of the War Department to consider local conditions before placing contracts.

In each of the 60 congested cities the Bureau of Industrial Housing of the Labor Department has found it necessary to expend federal appropriations to relieve housing and transportation shortage.

In some cities the congestion is so great that the use of beds in three daily shifts has become imperative. This has created an exceedingly high labor turnover, delaying the completion of war work and increasing its cost.

It is not the intention to cut off new orders entirely from these districts but to regulate them. Where new plants require additional labor power or new structures or facilities are needed it will be the disposition of the General Staff to discourage such increases in these cities and to develop them elsewhere. The following cities are suffering from serious housing shortage:

Aberdeen, Md.	New Castle, Del.
Alliance, Ohio.	New London, Conn.
Alton, Ill.	New Orleans, La.
Bath, Maine.	Newport, R. I.
Bayonne, N. J.	Newport News, Va.
Bethlehem, Pa.	Niagara Falls, N. Y.
Bridgeport, Conn.	Niles, Ohio.
Butler, Pa.	Norfolk, Va.
Camden, N. J.	Pensacola, Fla.
Charleston, S. C.	Perth Amboy, N. J.
Charleston, W. Va.	South Amboy, N. J.
Chester, Pa.	Philadelphia, Pa.
Davenport, Ia.	Phillipsburg, N. J.
Dayton, Ohio.	Portsmouth, N. H.
Derby, Conn.	Portsmouth, Va.
Easton, Pa.	Puget Sound, Wash.
Eddystone, Pa.	Quincy, Mass.
Elizabeth, N. J.	Rock Island, Ill.
Erie, Pa.	Seattle, Wash.
Florence, Ala.	Sharon, Pa.
Hammond, Ind.	Sheffield, Ala.
Indiana Harbor, Ind.	Mariner's Harbor,
Jersey City, N. J.	Staten Island, N. Y.
Gary, Ill.	Tacony, Pa.
East Chicago, Ill.	Troy, N. Y.
Lowell, Mass.	Utica, N. Y.
Middletown, Ohio.	Warren, Ohio.
Milton, Pa.	Waterbury, Conn.
Moline, Ill.	Watertown, Mass.
Newark, N. J.	Watertown, N. Y.
New Brunswick, N. J.	

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New Departure Mfg. Co. to Hold Field Day

BRISTOL, CONN., Sept. 16.—The New Departure Mfg. Co. will hold its annual field day, which will include an inspection of the plant, a sheep barbecue, a ball game, sports, a golf handicap, etc., on Sept. 21-22. The company's slogan is "We wish to conserve for ourselves and our help a spirit of good will and optimism, a pleasant place in which to live and work and an establishment to which our boys now at the front may return. In all else we Hooverize."

—

Goodyear Company Salvages $3,000,000 in Year

AKRON, Sept. 11—The Goodyear Tire & Rubber made in 1 year a salvage of $3,000,000 worth of materials that might have been wasted were it not for the cooperation of its 20,000 workmen. This is a larger amount than the output of finished product of 98 per cent of the country's manufacturing concerns.

Latin America Big Automotive Buyer

Exports from New York Alone Total Over $7,500,000 in Seven Months

NEW YORK, Sept. 16—An analysis of the exports of passenger cars, trucks and parts to the various Latin-American republics for the seven months ending July, 1918, discloses some interesting figures, and indicates that, despite limited shipping facilities, manufacturers are not neglecting the opportunities offered by South and Central America, Cuba, etc.

During these seven months 5243 passenger cars, valued at $4,771,654; 419 trucks, valued at $751,222, and automotive parts, valued at $2,020,696, were shipped from the port of New York alone, the aggregate value being $7,543,572. Obviously the total exports to Latin America from the U. S. A. are considerably greater, as shipments have been made from a dozen or more different ports.

During the period under review Chile leads in passenger car purchases, partly for the reason that returning nitrate ships offer plenty of freight accommodations. A glance at the truck column suggests that there are good opportunities for the development of business in practically all the republics, more particularly as Latin-American business and finances are in a very flourishing condition and there is a general speeding-up of commerce to meet war demands.

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Missouri River Boats Stop

KANSAS CITY, Sept. 14—Navigation of the Missouri River between St. Louis and Kansas City was suspended for the winter, on Sept. 3, when a steamer with two barges arrived at Kansas City on its last summer trip. The equipment has been taken over by the federal authorities, and it will be used on the Mississippi below St. Louis. The barges have brought many motor cars to Kansas City this summer and much stock for accessory dealers. All traffic trucks distributed from the Kansas City branch have been brought from St. Louis on the barges, in shipments of six to nine. The trucks are run onto the roofs of the barges at St. Louis, and run from the barges onto the wharves at Kansas City; here they are filled with gasoline, and taken to the distributing headquarters under their own power. The river shipment has saved some freight expense, but has been most economical in its saving of labor in loading into freight cars. There has also been a marked advantage in time, the river shipments reaching destination within 5 days of leaving factory, while by railroad the shipments would have consumed from a week to a month.

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New York Routes Cars and Trucks

NEW YORK, Sept. 16—The New York Police Department has adopted a new system of routing passenger cars and commercial vehicles through the principal streets of the city. The plan has been adopted to eliminate confusion and reduce congestion. The order restricts 22 thoroughfares, chiefly the main north and south avenues, to passenger or commercial traffic, 10 being exclusively for passenger cars and 12 for motor trucks. Motor trucks will be prevented from using the streets designated for the use of passenger cars, though their drivers may make deliveries or collections of merchandise on those streets by entering them at the nearest intersecting street.

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International Harvester Merger Ratified

NEW YORK, Sept. 16—The Internal Harvester Co. of New Jersey and the International Harvester Corp. have been merged and the two companies will be continued as the Internal Harvester Co. The capital is $60,000,000 preferred and $80,000,000 common.

EXPORTS OF AUTOMOBILES, TRUCKS AND PARTS FROM NEW YORK TO LATIN-AMERICAN COUNTRIES DURING SEVEN MONTHS ENDING JULY, 1918

	Cars		Trucks		Value of
	Number	Value	Number	Value	Parts
Argentina	770	$779,302	33	$32,921	$986,780
Bolivia	10	14,052	2	9,000	2,343
Brazil	814	588,098	30	31,814	138,973
Chile	1,071	1,320,156	46	54,373	228,664
Colombia	95	66,715	1	600	17,770
Costa Rica	41	20,100	..	....	871
Cuba	430	470,268	174	398,774	329,446
Ecuador	54	57,882	..	....	4,356
Guatemala	5	8,099	1	322	2,307
Hayti	74	40,430	7	7,589	15,198
Honduras	18	14,927	..	....	4,626
Mexico	147	135,940	32	72,710	48,381
Nicaragua	23	15,875	..	...	733
Panama	45	36,343	26	17,631	25,816
Paraguay	1	2,500	1	875	768
Peru	389	448,244	46	96,113	53,250
Salvador	22	28,678	..	....	3,731
Santo Domingo	127	92,451	6	3,600	16,158
Uruguay	1,034	577,825	9	9,000	108,424
Venezuela	83	53,769	5	15,900	32,101
	5,243	$4,771,654	419	$751,222	$2,020,696

413,000 Bbl. Gasoline Saved

Two Gasless Sundays Add Materially to Reserve for Overseas Shipments

WASHINGTON, Sept. 16—Four hundred and thirteen thousand barrels of gasoline were saved by the observance of the first two voluntary motorless Sundays, according to the Fuel Administration. The Administration kept no records, but secured figures from the oil industries which took a count from 2 o'clock to 4 o'clock Saturday, Aug. 31, Sunday, Sept. 1, and Sunday, Sept. 8. In each instance there was an increased reduction on the second Sunday in the percentage of cars used. Illinois leads with counts of 20,000, Aug. 31, and 108 on Sept. 8, a reduction of 99 per cent. Reduction in every state exceeded 75 per cent. The Fuel Administration states that the gasoline saved has added materially to the reserves available for overseas shipments, for use in tanks, trucks and airplanes at the front. In answer to the question if gasolineless Sundays will be extended to include the territory west of the Mississippi, the Fuel Administration says it does not seem necessary, although it is possible. They are now canvassing the territory to determine the ability of the refiners to care for the West and at the same time provide the necessary gasoline at the Atlantic seaboard. If they cannot provide both demands the country west of the Mississippi will also be called upon to forego Sunday motoring temporarily.

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Briscoe Corp. Adds to Plant

JACKSON, MICH., Sept. 14—The Briscoe Motor Corp. is erecting two additional buildings for the manufacture of war material. These measure 200 x 200 and 90 x 100 ft. respectively.

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Government to Pay Cash

WASHINGTON, Sept. 18—All supply bureaus of the War Department will, hereafter, whenever possible, take advantage of cash discounts for the prompt payment of bills. Instructions to do so have just been issued by the General Staff. Contractors who have followed the custom of granting cash discounts to the public will be required to state in their proposals the amounts they will allow the Government for prompt payment of their bills. Where it has not been the custom to give fixed cash discounts the Government will request contractors to state how much they will allow for prompt payment. These discounts will be considered by contracting officers when making awards.

That the Government may be sure of such discounts in the future it is provided in the instructions that all materials and supplies shall, in so far as possible, be inspected and accepted by the Government at the point of manufacture or origin. The Inspecting Officer is ordered to see that the proper vouchers are sent through promptly with the Government bill of lading attached, to the Contracting officer so that the bill may be paid within the specified time during which discounts will be allowed.

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Truck Sales Directors to Form National Association

MILWAUKEE, Sept. 16—A national association of sales directors of American motor truck manufacturers probably will be permanently founded this week at a meeting to be held in Detroit, as the result of a conference attended by representatives of ten of the largest commercial vehicle factories of the country, which was held in Milwaukee during the past week. The Milwaukee conference was called upon the initiative of William H. Reese, advertising and sales manager of the Sterling Motor Truck Co., which entertained the representatives for two days. A temporary organization was formed and each delegate was appointed a committee of one to solicit the attendance of one other sales manager for the Detroit meeting this week. The purpose of the organization is to plan ahead for the time when not so much of the capacity of truck factories is required for Government work and the industry is better able to produce vehicles for ordinary commercial channels in sufficient quantities to meet the demand. Another aim is to insure a proper distribution of the trucks now available for commercial purposes to the end that each truck sold may be placed where it will do the most good.

July Truck Exports Very Small

Figures Indicate Our Export Trade in Motor Trucks Is Not Satisfactory

NEW YORK, Sept. 17—A glance at the record of automotive products exported during the month of July shows that although the figures covering cars and parts are normal, the number of trucks exported during the month is distinctly disappointing. It is true that France has taken a considerable number—there are very obvious reasons why she must do so—but apart from this the total for the month is so very small as to be almost negligible. As a matter of fact our truck exports for the month, including those sent to France, is little more than one-half the total value of those shipped abroad in June. Deduct the July deliveries to France and the remainder are valued at but $237,330.

No doubt there may be a shortage of shipping from time to time, which, in part, accounts for the falling off, but the transportation problem is being solved and shipping is now a great deal better to Latin American and other parts than was the case a little time ago.

Every encouragement is being given by the Government to the development and maintenance of foreign trade. Truck builders are in a priority class as regards the supply of material for approved use.

AUTOMOBILE, TRUCK AND PARTS EXPORTS FROM NEW YORK FOR JULY

	Cars		Trucks		Parts
	No.	Value	No.	Value	Value
Argentina	149	$226,927	1	$3,250	$214,466
Australia	293	268,526	..	....	19,162
Barbadoes	1	600	..	....	500
Bolivia	..	....	2	9,000	123
Brazil	151	159,152	14	8,400	26,585
British Guiana	3	1,731	..	....	618
British Oceana	..	....	..	....	78
British South Africa	..	....	..	....	6,749
British West Africa	18	14,859	..	....	14,103
British West Indies	7	4,355	..	....	1,955
Chile	92	127,675	4	7,102	52,647
Columbia	11	6,615	..	....	2,305
Costa Rica	..	....	..	....	84
Cuba	30	41,513	17	36,925	18,562
Dutch East Indies	32	25,705	..	....	....
Dutch Guiana	..	....	..	....	633
Danish West Indies	..	....	..	....	76
Dutch West Indies	..	....	..	....	190
Ecuador	13	13,400	..	....	458
England	2	8,500	38	108,726	25,165
France	138	70,590	128	503,802	555,532
French Africa	21	11,282	9	7,305	....
French Guiana	1	318	..	....	17
French West Indies	..	....	..	....	201
Greece	..	....	..	....	328
Guatemala	..	....	..	....	160
Hayti	5	2,360	..	....	1,594
Honduras	1	2,500	..	....	266
Ireland	..	....	2	4,276	....
Italy	17	30,000	..	....	15,761
Jamaica	20	15,654	..	....	2,338
Japan	49	48,035	5	4,565	23,273
Japanese China	..	....	..	....	476
Mexico	10	6,385	2	6,250	2,998
Newfoundland	19	15,520	..	....	253
New Zealand	90	72,984	2	2,342	31,536
Nicaragua	4	2,976	..	....	....
Norway	36	92,190	..	....	640
Panama	2	2,400	..	....	1,231
Para	..	....	..	....	21
Peru	77	91,178	4	11,240	10,222
Portugal	16	17,185	1	3,950	4,375
Salvador	1	1,500	..	....	644
Santo Domingo	14	15,901	..	....	2,888
Spain	87	100,844	2	8,000	4,828
Trinidad	12	10,875	7	15,089	3,126
Uruguay	183	161,221	..	....	17,869
Venezuela	5	6,098	..	....	3,818

Safety Congress at St. Louis

4000 Industrial Plants Represented—Special Automotive Sections

ST. LOUIS, Sept. 16—Almost 2000 delegates to the Seventh Annual Safety Congress of the National Safety Council registered to-day at the Hotel Statler. The Council represents about 4000 industrial plants and in his report W. H. Cameron, secretary of the Council, said:

"The total number of fatal accidents has been reduced one-third since this organization began its work. Five years ago 35,000 men and women were losing their lives every year in accidents, and the number of industrial accidents was about 2,000,000. With mechanical safeguards, supplemented by safety education in all plants, the number of accidents could be reduced not one-third, as it has been, but from 50 to 85 per cent, I believe."

The two big features announced for the first day of the convention were cancelled because Secretary of the Interior Franklin K. Lane and Charles M. Schwab of the Emergency Fleet Corporation telegraphed that they could not be present.

Mr. Schwab, who will speak on "The Democratization of Industry," will appear later in the week.

As a result of these cancellations, the first day was given over largely to business sessions and the reports of committees and the officers.

David Van Schaack of Hartford, Conn., director of publicity for the Aetna Insurance Co., who is president of the National Council, in his address at the opening session, dwelt upon the safety propaganda which the Council is now making its particular war—the introduction of safety instruction in schools.

Nearly 200 speakers, most of them representatives of the large industrial plants, are on the program for the five days, as the Congress ends Friday. At the dinner President Wilson will deliver a short address by telephone. There is a strong sentiment that some plan should be developed whereby the methods used by the Government in training maimed soldiers for new occupations should be maintained in the future for victims of industrial accidents.

The Automotive Section will meet on Friday. The program of that session is given on page 515.

The automotive industry also is interested in the "Public Safety" Section on Thursday afternoon, the program of which is as follows:

I. Automobile Headlamps, W. F. Little, Electrical Testing Laboratories, New York City.

II. Desirability of Uniform Signs and Signals, with Some Suggestions, John Gillespie, Detroit, Mich.

III. Public Accounts—What They Mean in Monetary Loss, A. W. Whitney, General Manager, Workmen's Compensation Service Bureau, 13 Park Row, New York City.

IV. The Classification of Public Accidents, Frederick S. Crum, Assistant Statistician, Prudential Life Insurance Company of America, Newark, N. J.

During the week of the Congress here a very special effort is being made to eliminate all accidents in the city, both industrial and street accidents. Policemen, drivers and shop workers are asked to use every precaution to show how few accidents are necessary to a large community. Almost every motor vehicle is carrying a special sign.

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Airplane Assembly System Incorporated in Training Course

WASHINGTON, Sept. 17—A system of airplane assembly has been incorporated with the general training course at Kelly Field, Texas, for both cadets and student officers. This is a departure from the general curriculum, is not general and has not yet been approved by the training section. At present the work includes 12 days of instruction in putting together wings and fuselage only. The other parts of the plane will enter into instruction as the course advances, until the practical assembling of a complete airplane is a part of the instruction of every flier. It is expected that this will prevent carelessness, tendency to hurry the work or to overlook anything that may later endanger life. It will take the prospective flier completely through all the shops.

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Pier Exposition Opens

CHICAGO, Sept. 16—The Automotive and Accessories Exposition opened on the Municipal Pier Saturday. A big floor space is used on one-half of the big pier building and the management expresses the belief that the week will disclose a successful exposition.

There is a total of 106 exhibitors, 78 of whom show parts and accessories. There are six complete trucks shown, two truck formers, four farm tractors and four tractor parts, one industrial tractor, one road tractor, one house lighting system and ten miscellaneous displays, including the Red Cross, State of Wisconsin agricultural exhibit, Cook County School, and some farm papers.

The exhibit of agricultural implements was limited to two disks and a plow attached to the three Fordson tractors, shown by the Rue Motor Co. The other tractor displays included the New Craig tractor with its P-T wheel, which makes its first appearance at this show, the Inter-State tractor and the Happy Farmer.

The chief tractor part exhibit is that of the Foote Bros. Gear & Machine Co. with its planetary tractor gearset. The Mercury Mfg. Co. had one of its industrial tractors on display, and the One-Wheel Truck Co. had a road tractor.

Motor trucks shown are the Winter, Muskegon, Traffic, Forschler and Tower.

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Washington Office for Duesenberg

WASHINGTON, Sept. 16—The Duesenberg Motors Corp. has established a Washington office in the Munsey Bldg. It is in charge of General Sales Manager N. G. Rost.

Tractor Curtailment Discussed

No Decision Reached—Further Curtailment in Agricultural Implements Considered

WASHINGTON, Sept. 17—A preliminary meeting was held here yesterday by the War Service Committee of agricultural implements and independent tractor manufacturers with the War Industries Board with a view to further curtailing agricultural implements and possible curtailment to some extent of the manufacture of farm tractors. No decisions were arrived at, the greater part of the discussions being on the importance of farm tractors both among our Allies and in this country. The War Industries Board stated that independent tractor manufacturers were present. Names of those at the conference could not be obtained owing to the fact that Judge Edwin D. Parker, Priorities Commissioner, who presided, did not make a record of them.

The farm implement and farm operating equipment industry has already discontinued the manufacture of 3000 surplus types of plows and tillage implements, as was announced in an earlier issue of AUTOMOTIVE INDUSTRIES. Further reduction of this and possible reduction of tractors is being considered to further conserve iron and steel for other war needs.

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A Substitute for Glass in Aviators' Goggles

WASHINGTON, Sept. 17—The Medical Research Board of the Division of Military Aeronautics has found a substitute for glass for aviator goggles made of thin sheets, not glass, but which can be used as such. This substance has been on the market for some time, but the company which makes it has not heretofore been able to cast it in the right strength and thickness suitable for goggles. The substance is hard and non-inflammable and insures practically a non-shatterable lense for the protection of the pilot's eyes.

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Deferred Classifications for Transportation Employees

WASHINGTON, Sept. 17—Concerns engaged in the transportation within cities and along the public highways of necessary commodities can claim deferred classification for their necessary employees, according to a ruling made here to-day by the Provost Marshal General of the War Department. This means that a motor truck transportation company hauling merchandise or commodities essential to the maintenance of the military establishment, or the effective operation of the Army, or the maintenance of national interest during the emergency, can claim deferred classification in the draft for their employees providing they are necessary to them.

Jarosch Leaves Bearings Co.

LANCASTER, PA., Sept. 12—F. J. Jarosch has resigned as chief engineer of the Bearings Co. of America and become secretary and manager of the Liberty Engineering Co., Lancaster, Pa., recently formed for consulting, designing, research and development work. Associated with him are: President, J. E. Perkinson; vice-president, C. W. Lea, and treasurer, R. A. Heiland.

—

M. Bleiweiss has been appointed manager of the planning department and stores of the Templar Motors Corp., Cleveland. He retires from the Premier Motor Corp., Indianapolis, where he served as assistant to sales manager and assistant to factory manager.

—

Guy E. Tripp, formerly Colonel United States Army and head of Production Division, has been made Brigadier-General United States Army, and placed in charge of the production of ordnance material. General Tripp is succeeded as head of the Production Division by Colonel C. C. Jamieson.

—

Zeno D. Barns, who for the past 3 years has been connected with the Westinghouse Air Brake Co. as non-ferrous metallurgist, is now connected with the general operating department of the Aluminum Castings Co., Cleveland.

—

Fred W. Vormelker has been appointed efficiency engineer of the Russel Motor Axle Co., North Detroit, and will have charge of all work pertaining to the following departments: Time study, routing, factory time, employment and efficiency.

—

Charles M. Steele, formerly vice-president of the Carl M. Green Co., Detroit, who has been in this country on leave of absence for the past 2 mo., has returned overseas to continue his work with the Y. M. C. A. He is located in Paris and is in entire charge of the entertainment division of the Y. M. C. A. work in France.

—

Memorial Road for Michigan

DETROIT, Sept. 14—Willard M. Bryant, Kalamazoo paper manufacturer and field secretary of the Michigan State Good Roads Association, is the leader of a movement having for a purpose the building of a "Memorial Paved Way," 18 ft. wide and extending throughout Michigan for a distance of 300 miles.

It is to be a memorial in honor of the fallen soldiers of the state. The route proposed is through St. Joseph, Benton Harbor, Kalamazoo, Camp Custer, Battle Creek, Charlotte, Lansing, Owosso, Saginaw to Bay City. It is said that the project has met with the approval of many prominent men in the state and that it may result in a permanent organization being established to get the project under way.

Men of the Industry

Changes in Personnel and Position

Sandusky Changes Personnel

SANDUSKY, Sept. 14—The Dauch Mfg. Co., which produces Sandusky tractors, has made two changes in its personnel: L. E. Willson has been appointed general sales manager, and J. W. Wellington, general manager. Willson was formerly vice-president in charge of sales of the Briscoe Motor Corp., Jackson, Mich., and Wellington was formerly production manager of the New Castle (Ind.) plant of the Maxwell Motor Co.

—

Clay G. Howery, formerly associated with the production and purchasing departments of the Continental Motors Corp., Detroit, has been appointed general manager of the American Steel Supply Syndicate, Detroit. The management has been reorganized and the company equipped with an extensive screw machine and heat-treating department. The corporation is working almost entirely upon Government orders, manufacturing parts for engines.

—

George T. Bryant, formerly connected with the Russell M. Seeds Advertising Agency, has been appointed sales manager for the Hide, Leather & Belting Co., Indianapolis. This company manufactures leather belting and parts for cars, trucks and tractors.

—

Norval A. Hawkins, sales manager for the Ford Motor Co., has entered the United States Army Ordnance Department as an assistant to Major George D. Wilcox, who is in charge of the Motor Transport Service for the Detroit district. Mr. Hawkins has been granted leave of absence by the directors of the Ford company to permit him to devote all his time to Government work. He will resume his duties with the company when his services are no longer required by the Government.

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Furlough Essential Skilled Men

WASHINGTON, Sept. 14—Companies engaged in war work who find that the draft is taking their skilled men in such numbers as to impair efficiency and seriously reduce production of war material may apply to William R. Ritter, War Industries Board, for the furlough of these essential skilled men. Investigations will be made by the Commodity Section Chiefs of the War Industries Board, and Mr. Ritter will decide regarding the furloughs following their recommendations.

Emil Grossman in New Business

NEW YORK, Sept. 14.—Emil Grossman, former president of the Emil Grossman Mfg. Co., has instituted a new business, styled E. G. Mfg. Co., located at 50 West 54th Street. The company's business consists of locating surplus stocks of automotive equipment and supplying jobbers whose stocks are short.

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Samuel W. Prussian, president and owner of the Guaranty Truck Co., Cambridge, has accepted a position in the Quartermaster's Department for the duration of the war, although he is exempt from the draft because of his age.

—

Harry W. Ford, former president of the Saxon Motor Car Corp., Detroit, has gone to Washington and is associated with Colonel Barret Andrews in the reorganized Army Transport Corps under General Drake.

—

E. S. Ralph, for several years with the advertising department of the American Seeding Machine Co., Springfield, Ohio, has been appointed advertising manager of the R. & P. Tractor Co., Alma, Mich.

—

George C. McMullen has been appointed Western representative of the Timken Roller Bearing Co., with headquarters in San Gabriel, Cal.

—

W. H. Conant of New York, formerly manager of the Pittsburgh Motor Vehicle Co., is now manager of the Prismolite Co., Columbus, Ohio.

—

S. A. Campbell, formerly sales manager of the Warnola Mfg. Co., New York, is now associated with the Bay State Pump Co., Boston.

—

American Motorcycles for Canadian Police

MONTREAL, Sept. 13 — Thirty-five motorcycles are being purchased for the police department, at a cost of between $400 and $500 apiece. Twenty will be Harley-Davidsons, obtained from the Art. Ross Co., and fifteen will be Hendersons, obtained from Graveline & Kennedy. Delivery of some of the machines has already been made.

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Lansing Forge Enlarges Plant

LANSING, Sept. 12—The new addition to the Lansing Forge Co. is expected to be completed by Oct. 1. The new facility is 67 by 80, and will be used for dies and stock storage. The company took over the property of the old Emergency Drop Forge Co., which went into the hands of a receiver. The new organization consists of outside capitalists who make a special of the forging business. Many changes have been made in the old plant, which has been modernized in every way.

Lease Old Pathfinder Plant

INDIANAPOLIS, Sept. 15—The plant of the Pathfinder Automobile Co., which recently passed through dissolution proceedings, has been leased by the S. M. Dixie Shoe Polish Co. of Brooklyn, N. Y., and will be used for the manufacture of shoe polish.

—

Indiana Truck Corp. Erecting Building

INDIANAPOLIS, Sept. 15—The Indiana Truck Corp., Marion, is erecting a new building 70 x 200 ft. The building will be of fireproof construction. The company has recently received government contracts which have necessitated the increasing of its manufacturing facilities.

—

Sun Plant Is Sold

INDIANAPOLIS, Sept. 15—The plant of the Sun Motor Car Co., Elkhart, has been sold to W. L. Huffman, Omaha, who announces plans for establishing a company for the manufacture of motor trucks. The plant contains 60,000 ft. of floor space. The new owner has announced no plans as to the type of truck to be manufactured.

—

Truck Man Adds Tractors

CHARLES CITY, IOWA, Sept. 14—The American Engine & Tractor Co. has closed a contract with the Brehm-McMullen Co., Minneapolis, for 300 Matchless-American 15-30 farm tractors. The Brehm-McMullen Co. is Acme truck distributer.

—

Smith Engineering Works Extends Plant

MILWAUKEE, Sept. 16—The Smith Engineering Works has broken ground for a two-story machine-shop and office building, 67 x 100 ft., to cost $32,500. The company is a large builder of machine-tools, machinery and metalworking shop equipment.

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Winther Increases Manufacturing Facilities

KENOSHA, WIS., Sept. 16—The Winther Motor Truck Co., Winthrop Harbor, Ill., which is now at work on its new $125,000 truck manufacturing plant, is enlarging the scope of the project to some extent by making provision for a one-story building, 50 x 70 ft., to be used for offices and drafting rooms. The factory is expected to be ready for occupancy about the middle of October.

—

Oil Co. Effects Another Consolidation

APPLETON, WIS., Sept. 16—The Badger Producing & Refining Co., which is operating several large oil wells in Oklahoma, has absorbed the Green Bay Oil & Gas Co., Green Bay, Wis., and its holdings in Texas and Oklahoma. This is the second consolidation within a short time, the Badger company having taken over the Appleton Oil & Gas Co. in July. The main offices of the three merged companies will continue to be located in Appleton.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

New Company Takes Over Fickling Plant

LONG ISLAND CITY, N. Y., Sept. 16—The Enameling & Stamping Corp. of New York has taken over the plant of the Fickling Enameling Corp., at Second and Webster Avenues, and has re-equipped it with up-to-date appliances designed to handle baked-on enameling, rust-proof coating, etc., on fenders, hoods and automotive accessories of all kinds.

—

Velie Develops Kerosene Device

MOLINE, Sept. 14—The Velie Motors Corp., following a series of tests with a kerosene device for its passenger cars here last Monday, has decided to start manufacturing the device, which it will sell to other makers of cars, the U. S. Government and to Velie owners. The device was first used on Velie tractors. Then it was further developed for trucks, and now it has been further perfected for passenger cars. The tests last Monday were severe. There were present as observers some of the big distributers, and they rode in the cars to note at close range how the device worked.

—

Overland Gets British Order

TOLEDO, Sept. 14—The Willys-Overland Co. has received an order from the British Government for 10,000 semi-chassis for war purposes. The amount of the contract is around $7,500,000, it is stated, which brings the total business of the company for the United States and its allies up close to the $50,000,000 mark. It is understood that negotiations for important military work are still pending.

—

New Jobber in Utah

SALT LAKE CITY, Sept. 14.—The Motor Mercantile Co. has entered the automotive equipment jobbing trade at 115-117 South West Temple Street in a modern three-story building. It is wholesale only. The principals are: A. D. McMullen, president and general manager, formerly of the Strevell-Paterson Co. and Capital Electric Co.; vice-president, E. J. Raddatz; secretary and treasurer, F. A. Pyke; sales manager, V. A. Culver; buyer, George G. Hansen, formerly buyer for the Chanslor & Lyon Co., San Francisco. The directors are McMullen, Pyke, Raddatz, Culver and J. P. Gardner. The active officers are all well known to the inter-mountain trade.

Arbenz Factory Practically Suspends Operations

CHILLICOTHE, OHIO, Sept. 14—The Arbenz Car Co. has practically suspended operations owing to its engineer, N. J. Arbenz, being with the expeditionary force and to the difficulties experienced in obtaining material and labor. A few cars, for which parts are in stock, are being finished.

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Amazon Purchases O'Neill

AKRON, Sept. 16—The Amazon Rubber Co. has purchased the tire accessory business of the O'Neill Tire & Rubber Co. The purchase includes the exclusive right to the name O'Neill. The O'Neill business will be added to the Amazon business and continued.

—

New Plant for Bailey Co.

CHICAGO, Sept. 16—The George D. Bailey Co., which manufactures the Bailey ball thrust bearing for Fords and Chevrolets, and also the R C magneto coupling, has moved into its new plant at 4500-06 Ravenswood Avenue.

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Moon to Build Army Trucks

ST. LOUIS, Sept. 16—The Moon Motor Car Co. has contracted to build 300 motor trucks for the Army, the first truck order this company has received.

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Hamilton Making Tractors

TORONTO, ONT., Sept. 14—The Hamilton Gear Machine Co., largest machine cut gear manufacturing company in Canada, has entered the tractor field with a machine of its own design—the Straight Line Tractor. It is a three-plow job, conservatively rated at 12-25 hp., and is of the four-wheeled type with large diameter front wheels.

—

More Room for G. & J. Tire

INDIANAPOLIS, Sept. 15—The G. & J. Tire Co., of this city, has awarded a contract for a warehouse to cost $50,000. The new structure will be two stories high, with brick walls and slow-burning construction. It will have a frontage of 70 ft. and a depth of 170 ft.

—

Boone Tire Extends Plant

CHIPPEWA FALLS, WIS., Sept. 16—The Boone Tire & Rubber Co., Sycamore, Ill., which is putting the finishing touches upon its new and main factory at Chippewa Falls, Wis., announces that George M. Graham has become associated with the plant as works manager. Mr. Graham is a tire and rubber expert with wide foreign and American experience and comes to the concern from Pennsylvania. The beginning of regular production at Chippewa Falls has been greatly delayed by the difficulty in getting delivery of some of the machinery and equipment, but most of this is now on the ground.

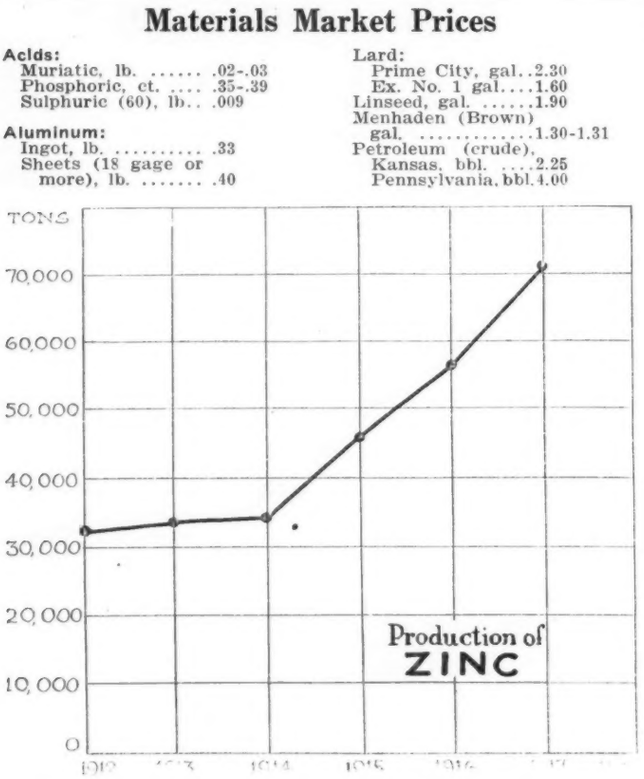
AUTOMOTIVE MATERIALS MARKETS

Materials Market Prices

Acids:
Muriatic, lb. ..... .02-.03
Phosphoric, ct. .... .35-.39
Sulphuric (60), lb.. .009

Aluminum:
Ingot, lb. ..... .33
Sheets (18 gage or more), lb. ..... .40

Lard:
Prime City, gal..2.30
Ex. No. 1 gal....1.60
Linseed, gal. 1.90
Menhaden (Brown) gal. 1.30-1.31
Petroleum (crude),
Kansas, bbl. 2.25
Pennsylvania, bbl.4.00



This chart shows a steady increase in the production of zinc in the U. S. A. since the commencement of the war. The United States, although not the largest producer of zinc, shows the greatest increase of any country in recent years

Antimony, lb. ..... .13¾-.13⅞
Burlap:
8 oz., yd..... .17¼-.17½
10½ oz., yd..... .22 -.22½
Copper:
Elec., lb. ..... .26
Lake, lb..... .26
Fabric, Tire (17¼ oz.):
Sea Is., combed, lb.1.65-1.70
Egypt, combed, lb.1.25-1.35
Egypt, carded, lb..1.20-1.30
Peelers, combed, lb.1.05-1.20
Peelers, carded, lb. .95-1.05
Fibre (⅛ in. sheet base), lb. ..... .50
Graphite:
Ceylon, lb. ..... .07½-.25
Madagascar, lb. .... .10 -.15
Mexican, lb. ..... .03¾
Lead, lb. ..... .08 -.09
Leather:
Hides, lb. ..... .18 -.35¼
Nickel, lb. ..... .40 -.43
Oil:
Gasoline:
Auto., gal. ..... .24½
68 to 70 gal..... .30½

Rubber:
Ceylon:
First latex pale crepe, lb. ..... .61 -.63
Brown, crepe, thin, clear, lb. ..... .60
Smoked, ribbed sheets, lb. ..... .59 -.61½
Para:
Up River, fine, lb. .68
Up River, coarse, lb. ..... .40
Island, fine, lb... .59
Island, coarse, lb. .27
Shellac (orange), gal. .70 -.76
Spelter ..... .09½-.09¾
Steel:
Angle beams and channels, lb. .... .03
Automobile sheet (see sp. table).
Cold rolled, lb..... .06½
Hot rolled, lb..... .03½
Tin ..... .78 -.79
Tungsten, lb. 2.45
Waste (cotton), lb... .12¾-.17

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock	$5.95	$5.85
Automobile body stock, deep stamping.	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45

Automobile Sheet Extras for Extreme Widths:
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.
Nos. 19 and 21 over 35 in. to 44 in., 30c. per 100 lb.
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.

Black Sheet Extras to Apply to Narrow Widths:
Oiling, 10c. per 100 lb.
Patent leveling, 25c. per 100 lb.
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.

Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
Ajax Rubber Co	60½	62½	..
J. I. Case T. M. Co., pfd	81	83½	+3
Chalmers Motor Co., com	4	6	..
Chalmers Motor Co., pfd	20	30	..
Chandler Motor Car Co	86½	88¼	—1¼
Chevrolet Motor Co	115	122	—14
Fisher Body Corp., com	36	37	..
Fisher Body Corp., pfd	84	85	..
Fisk Rubber Co., com	60	62	..
Fisk Rubber Co., 1st pfd	97	103	..
Fisk Rubber Co., 2nd pfd	79	83	..
Firestone Tire & Rubber Co., com	105	107	..
Firestone Tire & Rubber Co., pfd	94	96	..
General Motors Co., com	114¾	116	—10¼
General Motors Co., pfd	78	78½	— ¼
B. F. Goodrich Co., com	46½	47½	+ ½
B. F. Goodrich Co., pfd	99½	101	..
Goodyear Tire & Rubber Co., com	152	155	..
Goodyear Tire & Rubber Co., 1st pfd	99½	100¼	+ ¼
Grant Motor Car Corp	1½	2½	— ¾
Hupp Motor Car Corp., com	3	3¼	..
Hupp Motor Car Corp., pfd	78	82	..
International Motor Co., com	32	39	+1
International Motor Co., 1st pfd	62	66	..
International Motor Co., 2nd pfd	36	41	..
Kelly-Springfield Tire Co., com	47¾	49	+ ¾
Kelly-Springfield Tire Co., 1st pfd	79	87	—2½
Lee Rubber & Tire Corp	20	21	+ ½
Maxwell Motor Co., Inc., com	25⅝	26	—1
Maxwell Motor Co., Inc., 1st pfd	56½	57½	—1½
Maxwell Motor Co., Inc., 2nd pfd	20	20½	— ½
Miller Rubber Co., com	106	108	.
Miller Rubber Co., pfd	95	96	..
Packard Motor Car Co., com	120	126	+2
Packard Motor Car Co., pfd	90	93	—1
Paige-Detroit Motor Car Co., com	15½	16½	— ½
Peerless Truck & Motor Corp., com	14	16	—1
Portage Rubber Co	105	109	..
Reo Motor Car Co	14¾	15½	+ ¼
*Saxon Motor Car Corp	5	7	— ¼
Standard Motor Construction Co	12½	13¼	..
Standard Parts Co	60	65	..
*Stewart-Warner Speed. Corp	56½	57½	— ½
*Studebaker Corp., com	45¼	46¼	—1¼
*Studebaker Corp., pfd	85	90	+5
Swinehart Tire & Rubber Co	50	60	..
United Motors Corp	27¼	27½	—4
*U. S. Rubber Co., com	60	61	2
*U. S. Rubber Co., pfd	103½	105	+ ½
*White Motor Co	45¾	46¾	— ¼
*Willys-Overland Co., com	19⅜	20⅜	— ⅛
*Willys-Overland Co., pfd	81	83	—1

*At close Sept. 14. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co	..	7¾	..
Bower Roller Bearing Co	..	18¼	..
Chevrolet Motor Co	115	122	—10
Continental Motor Co., com	5⅜	5½	..
Continental Motor Co., pfd	..	94	..
Edmund & Jones, com	..	17	..
Edmund & Jones, pfd	..	90	..
Ford Motor Co. of Canada	150	152	—1
Hall Lamp Co	..	14	..
Michigan Stamping Co	..	..	..
Packard Motor Car Co., com	..	125	..
Packard Motor Car Co., pfd	..	..	..
Paige-Detroit Motor Car Co	..	16¾	..
Prudden Wheel Co	10⅛	..	+1
Reo Motor Car Co	..	..	..

INACTIVE STOCKS

Atlas Drop Forge	..	25	..
Kelsey Wheel Co	25	..	..

Industrial Review of the Week

A Summary of Major Developments in Other Fields

August Output of Steel Ingots Shows Increase

The close relation between steel works output in the United States and the steady pushing forward of American lines in France has been emphasized in the past week. Manufacturers of barbed wire were called to Washington to plan for quickly increasing output, after many weeks of restricted production. The entire capacity, which is 50,000 tons a month, may soon be engaged. Besides American requirements a new call has come for 60,000 tons for Italy and 65,000 tons for Great Britain, and the latter amount may be increased to 90,000 tons.

One Pittsburgh mill, on an urgent order for 80-lb. rails for France received last Wednesday rolled 20,000 tons before the end of the week. There is an entirely unprecedented volume of shell steel orders; sheets are wanted in large quantities for trench shelters and rolling kitchens, and in all ways the needs of the American army have been pressed upon the steel mills, until for one week the incessant call for ship plates has become an undertone.

There has been a week of meetings in New York preparatory to the quarterly price conference in Washington, now set for Sept. 19 instead of the day preceding. Lake Superior iron ore producers, particularly underground miners, have formulated their argument for a second advance. Eastern iron ore companies have come together for the first time and will be represented at the price table. Wire companies have agreed that barbed wire should be advanced $5 a ton and nails by a like amount. The smaller steel makers who buy their pig iron, and who represent about 10 per cent of the finished material output in important lines, will make a stronger appeal than at any previous conference.

Foundry pig iron producers decided at their meeting last Thursday that their case must be presented separately at Washington and not through the general steel committee. Regional prices are being agitated and the Southern furnace companies are especially insistent.

At Washington, while the cry still goes up for greater production, there is little encouragement to the pleas for higher prices, though some producers, both of pig iron and finished steel, are claiming that in the last quarter of the year their costs will be higher than present prices.

Attempts to bring steel plants under the rulings of the National War Labor Board continue and the situation is tense, not so much from actual differences between the manufacturers and employees as from the efforts from without to raise issues that will bring Government interference.

Chicago at last reports definite announcements of the prices secured by agricultural implement buyers through Government intervention, including 25 per cent discount on shafting and disk steel at 7.5c. An order for 15,000 tons of rivets is being placed this week for Hog Island. Government absorption of bolt and nut as well as rivet output is more complete.

Jobbers have not been encouraged by the week's developments as to army requirements. Their B4 classification gives less and less promise of stock replacements as the revised schedule of imperative shipments to France keeps mounting.

The price of domestic manganese ore is involved in a conference being held to-day (Wednesday) on the amount of Brazilian ore to be imported in the remaining months of the year. If these imports are reduced, exports to South America must be cut down, as manganese is now simply return cargo for ships that will not be allowed to come back light. If manganese imports from Brazil are reduced, higher prices for domestic ores and for ferromanganese will be urged.

The August output of steel ingots is estimated at 3,498,000 tons for 27 working days against 3,532,600 tons for 26 days in July. Steel works production thus suffered to a greater extent last month than that of pig iron.—*Iron Age.*

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Texas Co. Report Shows Remarkable Record

NEW YORK, Sept. 16—The gross earnings of the Texas Co. as shown by the company's report show an increase from $26,391,745 to $80,260,633 during the years 1915 to 1918, each total being for the fiscal period ending June 30. Net earnings during the same period have increased from $8,024,692 to $34,873,402 and the surplus for 1918 is $14,397,241 as compared with $3,393,327 for 1915. Profit and loss surplus has risen from $14,529,301 to $54,667,429.

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Chevrolet Motor Co. to Dissolve

NEW YORK, Sept. 17—The directors of the Chevrolet Motor Co. are calling a special stockholders' meeting on Oct. 11, at Wilmington, Del., for the approval of a plan involving the dissolution of the company and a distribution of its assets. The Delaware corporation only will be dissolved under this scheme, the several subsidiaries operating under the name of the Chevrolet Motor Co. being continued as going concerns.

As the Chevrolet assets, with the exception of the company's holdings of General Motors stock, have been absorbed already by the General Motor Corp., it was realized there was no advantage in keeping the corporate name of the Chevrolet Motor Co. alive; hence the decision to dissolve the company and distribute its assets to the stockholders.

Bituminous 17,000,000 Tons Behind Schedule

As was to be expected, the observance of the Labor Day holiday throughout the mining regions cut into the production of both anthracite and bituminous coal during the week ended Sept. 7. Bituminous output totalled 11,249,000 net tons for the week (5½ days), while anthracite shipments for the same period amounted to 1,617,579 net tons.

It should be recorded, however, that the miners at quite a few operations made up for the holiday by working extra time the Saturday preceding, and another fact which should be emphasized is that the percentage of absenteeism the day following the holiday was negligible. Appeals to the miners for more regular working time are undoubtedly having their effect.

Bituminous coal output is now approximately 17,000,000 net tons behind schedule, and production for the rest of the coal year must be maintained at the rate of 2,041,000 net tons a day if the deficit is to be made up. The car supply is now excellent, however, and the bituminous mines have everything in their favor for a drive on greater output. Anthracite production for the coal year to date is estimated at 45,645,597 net tons, which is an increase of 1,084,000 net tons over the same period of last year.

Market conditions present no radical changes. The Fuel Administration has the distribution and allotment of all grades of coal well under control, and a determined effort is being made to supply the Northwest before navigation on the lakes closes for the season. Dealers have many unfilled orders on their books, but the total quantity of coal delivered to domestic consumers to date is far greater than was true at this time last year.—*Coal Age.*

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Fox Leaves Saxon

DETROIT, Sept. 17—C. L. Fox, assistant sales manager of the Saxon Motor Car Co., will leave next week for Jacksonville, Fla., where he will go into training in the Motor Transport Corps.

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Two New Strom Bearing Offices

CHICAGO, Sept. 16—The U. S. Ball Bearing Mfg. Co. has opened two new sales offices. A San Francisco office at 434 Rialto Bldg. is in charge of S. C. Kyle. A Detroit office at 1437 Dime Bank Bldg. is in charge of A. deMaringh.

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Abandon Importers' Salon

NEW YORK, Sept. 16—The Annual Importers' Automobile Salon, which is held at the Hotel Astor in New York and at the Congress in Chicago, has been abandoned. Members of the board of directors voted unanimously not to hold the event.

China Offers Poor Prospect for Automotive Industry

By Harold B. Wilson

CANTON, CHINA, Aug. 8—It will probably be many years before the automotive industries reach any great prominence in China, especially in the South. Canton is the largest of the southern cities. It has 2,000,000 inhabitants and occupies a space of only about 20 sq. miles. Outside of the Bund, a 2-mile street along the river and about three other very short streets, there is not a roadway in the city wide enough for an automobile to operate.

There is one automobile here, belonging to one of the generals, and when it comes down the Bund, it excites as much attention as a circus parade in Bingville. Where possible cartage is handled on the river and canals. Coolies equipped with bamboo poles and rope take care of the remainder.

Before automobiles can be used roads must be built. At present the only means of passage through the rural districts are paths just wide enough for two people to pass on foot or on horse back. Many places these paths are not wide enough for two people to pass on foot and wooden platforms are built over the rice fields for one to stand on while others pass.

The principal farming here is rice and truck growing.. Truck patches are usually very small and all the work is done by hand. Rice fields are small also and since the plowing is done when the ground is under water or at least very wet, tractors are cut out of the question. Water buffaloes are the only power for this work.

The coast towns like Hong Kong and Shanghai have many automobiles but comparatively few trucks. Gasoline is so dear and coolies so cheap is the chief reason for this absence of trucks. Automobiles are used mostly for business purposes. These cities are trade centers and as the street car systems are very poor many business men find cars very convenient but expensive, as gasoline costs approximately $1 gold per gallon at the present time. The radius of the travel out of Hong Kong is too short for automobiles to be used, to any great extent, for pleasure.

In Canton and Hong Kong the motorboat is far more important than the automobile at present and will continue to be for some years to come. They are really a necessity to business concerns. The Standard Oil Co. and the Asiatic Petroleum Co. have a number of motor houseboats for work in the interior. Other concerns will doubtless follow their example when their business up country has reached sufficient volume to warrant it. The most popular fuel for motorboats is kerosene as the cost is a little less than half that of gasoline. Many of the larger boats are equipped with surface ignition crude oil engines. One Chinese concern, the Hip Tung Wo Engine Co., is doing a thriving business building and operating surface ignition oil engine passenger boats and tugs. The day will come when China will have roads and her people will have money to buy automobiles. First she must have a stable and efficient government and a large foreign trade. She has been marking time for a great many years but is beginning to show signs of progress. Her people are too intelligent and industrious to allow her to always remain in a rut.

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Consolidated Machine Co. Moves

The Consolidated Machine Co., Detroit, manufacturers of screw machine products, tools and gear blanks, has moved to 121 State Street, where more than double the former space is available. C. F. Richards is president of the company and Wayne C. Plummer is secretary and treasurer.

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Blackburn Co. Changes Name

CLEVELAND, Sept. 16—The automobile department of the Blackburn Specialty Co. will hereafter operate under the name of the Cox Mfg. Co. The company will continue the manufacture of locking devices and other accessories.

From New York to Chicago by Airplane in One Day

NEW YORK, Sept. 14—The landing of the postal airplane at New York, Sept. 10, recorded the first trip ever made by an airplane from Chicago to New York in a single day. The numerous attempts heretofore to make this flight have encountered interruptions which have prevented the completion of the trip until the succeeding day.

Pilot E. V. Gardner, accompanied by Edward Radle, mechanician, left Chicago at 6.25 a. m. in a plane propelled by a Liberty engine and landed at Hicksville, L. I., at 8.20 p. m. Allowing for one hour's difference in time and for stops made for replenishing of gas and oil, the trip from Chicago was made in 12 hr. and 55 min. The actual flying time, however was 10 hr. and 5 min., there being a delay of 1 hr. and 57 min. at Cleveland and another 53 min. at Lockhaven, Pa., in procuring gas and oil.

Fliers Slightly Injured

Mr. Gardner began his flight at Chicago in a driving rain and encountered a severe head wind at Cleveland. He flew over New York at an elevation of 7000 ft. and landed in the dark on a very bad field at Hicksville, L. I. In taking the landing the machine made a spill, slightly injuring the occupants. Mr. Gardner received a cut on his nose and near his left eye, and Mr. Radle was cut on the arm.

Two bags of mail for New York and connections were carried on the plane from Chicago and delivered at the New York post office.

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McCarthy Drill & Tool Has New Plant

TOLEDO, Sept. 16—The McCarthy Drill & Tool Corp. is now occupying its new two-story factory building at Clinton Street and Oakwood Avenue. About a year ago the McCarthy corporation purchased the Toledo Machine & Tool Co. Since taking possession, the company has expanded and enlarged its business and is handling export orders for drills, reamers and cutters, as well as an extensive direct government business.

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Calendar

ENGINEERING

Nov 14-15 New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

ASSOCIATIONS

Sept. 19-21 — Syracuse, N. Y. Semi-annual meeting of the American Gear Manufacturers' Association.

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

SHOWS

Sept. 8-20 — Greely, Weld Co., Colo. Tractor Show, Central Community Fair.

Sept. 9-14—Milwaukee, Milwaukee Automobile Dealers, Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.

Sept. 9-14 — Syracuse, N. Y. Tractor demonstration (State Fair). J. Dan Ackerman, Secy.

Sept. 9-15—Madison, Wis. Tractor demonstration (State Fair). O. E. Remy, State Fair Secretary.

Sept. 12-13—Marion, O. Tractor demonstrations, Farm Bureau Associations. M. C. Thomas, County Agricultural Agent.

Sept. 14-21—Chicago, Automotive and Accessories War Exposition. Municipal Pier.

Sept. 19-21 — Harrisburg, Pa. Tractor demonstrations, State Fair.

Sept. 23-28—Boise, Ida. Tractor demonstration (State Fair). J. C. Wooley, Moscow, Ida.

Oct. 1-5 — Washington, Ga. (Wilkes Co.). Tractor demonstrations, State Fair.

Oct. 12-19 — Atlanta. Tractor demonstrations Eastern State Fair and Automotive Exhibition.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Sept. 17-20 — Riverhead, L. I. Tractor demonstration (County Fair). Harry Lee, Secy.

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry P. Salter, Supt.

Oct. 16-18—Ottawa, Ont., International Plowing Match, Tractor and Farm Machinery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

RACING

Sept. 21—Sheepshead Bay.

Oct. 5 — Cincinnati. Cincinnati Speedway.